EXPORT OF STRATEGIC MATERIALS TO THE U.S.S.R. AND OTHER SOVIET BLOC COUNTRIES

HEARING

BEFORE THE

SUBCOMMITTEE TO INVESTIGATE THE ADMINISTRATION OF THE INTERNAL SECURITY ACT AND OTHER INTERNAL SECURITY LAWS

OF THE

COMMITTEE ON THE JUDICIARY UNITED STATES SENATE

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EXPORT OF STRATEGIC MATERIALS TO THE U.S.S.R. AND OTHER SOVIET BLOC COUNTRIES

MONDAY, OCTOBER 23, 1961

U.S. SENATE, SUBCOMMITTEE
TO INVESTIGATE THE ADMINISTRATION
OF THE INTERNAL SECURITY ACT
AND OTHER INTERNAL SECURITY LAWS,
OF THE COMMITTEE ON THE JUDICIARY,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:30 a.m. in room 2300, New Senate Office Building, Senator Kenneth B. Keating presiding.

Also present: J. G. Sourwine, chief counsel; Benjamin Mandel, research director; and Frank W. Schroeder, chief investigator.

Senator KEATING. The subcommittee will come to order.

Mr. SOURWINE. Mr. Chairman, may I be permitted to interrupt? At the executive sessions which opened this committee's investigations into this field, Senator Dodd, the vice chairman, made a short statement relating to the committee's jurisdiction. May I respectfully suggest that this be ordered laid into the record at this point?

Senator KEATING. That will be received in the record preceding my opening statement. It does set forth the basic jurisdictional authority of the committee.

(The statement referred to follows:)

Senator DODD. I want to make a brief statement so that all will be aware of what we have in mind here before we proceed.

The basic authority of this subcommittee stems from Senate Resolution 366 of the 81st Congress, 2d session. Among other things, the subcommittee has authority to conduct a complete and continuing study and investigation of the administration, operation, and enforcement of the Internal Security Act of 1950, and the administration, operation, and enforcement of other laws relating to the protection of the internal security of the United States.

We have requested representatives of the Departments of Commerce, Defense, and State to give us information regarding the administration of the Export Control Act and related functions pursuant to the Munitions Control Act and, more particularly, the shipment of strategic materials to the Soviet Union and Soviet bloc nations.

It is a matter of public knowledge that the challenge of Soviet power presents today a triple threat: first, military; second, economic; and third, subversive. And, as long as the principles of international communism motivate the regimes in Moscow and Peiping, we must expect that their single purpose will be the liquidation of our form of

free society and the emergence of a sovietized, communized world order.

To promote their objectives they have determined—cost what it may—to develop a military establishment and a strong national economy which will provide a secure home base from which to deploy their destructive foreign activities. Khrushchev is convinced that the final victory of communism can be achieved mainly by nonmilitary means. At the 21st Congress of the Communist Party of the Soviet Union, Khrushchev stated that the economic might of the Soviet Union is based upon the priority growth of heavy industry. He believes this should insure a Soviet victory in peaceful economic competition with the capitalist countries and that development of the Soviet economic might will give communism the decisive edge in the international balance of power.

It is essential that the United States does not play into the hands of the Soviets in helping them achieve their military and economic objectives. With this in mind, the subcommittee is seeking to learn the policies that are being carried out in the export of items to Soviet bloc countries.

Senator KEATING. These hearings have to do with our Government's export control policies and are long overdue. The basic statutes in this field go back more than a decade. The manner in which these statutes are being administered, the standards they establish, and their general effectiveness have not received the intensive consideration by Congress which the subject warrants.

It is apparent that our exports may have national security, as well as economic and foreign policy implications. The concern of this subcommittee is in the field of internal security, but we all recognize that this issue cannot be isolated from the others in a comprehensive review of the subject.

The fact that the subcommittee has scheduled these hearings does not necessarily imply, as far, at least, as the acting chairman is concerned, any criticism of the existing laws or their administration. However, it is a matter of record that the procedures for the granting of export licenses were substantially revised earlier this year after a subcommittee investigation of a proposed shipment of ball bearing machines to the Soviet Union. One of the purposes of this hearing will be to determine whether these new procedures are adequate to protect against future shipments of strategic materials to the Soviet bloc.

The difficult problems involved in controlling exports to the Soviet bloc reflect some of the most fundamental issues of the cold war. The Soviets have made their objectives of world conquest all too plain. Khrushchev has threatened our annihilation and burial on more than one occasion. Under these circumstances, it would be ridiculous and suicidal for Americans to contribute in any way to Soviet strength.

On the other hand, a cold war is not a hot war. We maintain diplomatic relations with the Soviets. We have cultural exchanges. And we do business with them. The time may come when a total embargo of trade with the Soviets may have to be considered, but our responsible leaders have not yet proposed such a course. As a result, decisions have to be made day by day and item by item as to what we can and cannot safely trade with the Soviets. These decisions must be

under continuous review, ideally so as to serve as a positive weapon for America in the cold war struggle, but at the very least to make certain that we are never serving Soviet cold war objectives.

Personally, I believe there should be a presumption against any exports to the Soviet bloc. I don't believe there is as sharp a distinction between economic and military items as is assumed, since anything we furnish to the Soviets in the way of economic goods helps them concentrate their efforts on military production. Moreover, our conflict with communism is economic as well as political and we have nothing to gain in this struggle by helping the Reds build up their economy by filling in gaps in their own production.

We must also make certain that American export policies are not frustrated by the failure of other free world nations to cooperate. If the Soviets can buy strategically important goods and machines from West Germany or Italy, our policy will not be effective and the one we may be hurting most is the American manufacturer. At the same time, I do not believe that we should license exports of such goods from this country just because alternative supplies exist, since broadening the base of supplies is also strategically important to the Soviets.

It is also essential that there be safeguards against the transshipment to the Soviets of goods destined for other countries. There have been reports of such shipments from our friend and neighbor, Canada. In the case of such dubious neutrals as Ghana or Guinea, the danger of transshipment increases. And in the case of outright Communist States such as Poland and Yugoslavia, the danger, in my opinion, reaches perilous proportions.

There is elaborate machinery, both national and international in character, designed to deal with these situations. But there is very little information as to how well the machinery is working and what standards are being applied. I hope that these hearings will serve to illuminate this whole subject.

Firm conclusions at this stage are not warranted, since all the testimony has not yet been heard. However, on the basis of the subcommittee's investigations to date, I want to express concern about several matters:

First, whether our defense agencies are playing a subordinate role to the Commerce Department in determining policy and making decisions in individual cases?

Second, whether we have taken steps to cut down on the volume of exports to the Soviet bloc as a result of the Berlin crisis?

Third, whether it is wise to apply a different standard to Yugoslavia and Poland from that we apply to the Soviets?

Fourth, whether we have done everything possible to obtain more cooperation from our allies on shipments to the Soviet bloc as well as Red China (on which, of course, we have a total embargo)?

Fifth, whether we are taking sufficient precautions to prevent shipments to so-called neutral and even friendly countries from getting into Communist hands?

Sixth, whether we are sufficiently utilizing our export policies as an affirmative weapon of the free world struggle against communism?

Seventh, whether we are giving too much weight to economic interests—such as the balance-of-payments problem—and too little weight to the interests of national security and foreign policy in issuing export licenses?

And, finally, whether adequate technical advice is available to prevent mistakes in the classification of items as nonstrategic, such as in the case of the ball bearing machines, upon which we held hearings some time ago.

It must be emphasized that this trade is not a two-way street. The United States is sending to the Soviet bloc two or three times the volume of goods which we import from these same countries and the volume and ratio in Russia's favor are increasing rather than decreasing. This period of international crisis is no time for a business-as-usual attitude. In my opinion, this is a very appropriate period to review the impact on our national security of trade with the Soviet bloc and I am confident that these hearings will shed a great deal of light on this subject.

I am pleased to welcome here this morning as observers at these hearings three of the members of the House select committee dealing with this same general subject, the chairman of that committee, Congressman Kitchin, Congressman Lipscomb and Congressman Latta. We are glad to have you here with us, and we hope that we will each mutually gain from the information which these subsequent hearings will develop.

We are glad to know that you have recognized the seriousness of this problem as we have, and that you are going into it in your own investigation.

Mr. Gwyer, would you rise and raise your right hand, please?

Mr. Gwyer, do you solemnly swear the evidence you give in this proceeding will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. GWYER. I do.

TESTIMONY OF JOSEPH A. GWYER, SENIOR RESEARCH SPECIALIST, LIBRARY OF CONGRESS

Senator KEATING. Would you give your full name and your address and present assignment for the record?

Mr. GWYER. My name is Joseph Anthony Gwyer.

Senator KEATING. That is G-w-y-e-r?

Mr. GWYER. G-w-y-e-r. I reside at 3223 Gainesville Street SE., Washington. I am a senior research specialist with the Library of Congress, currently on leave of absence.

Senator KEATING. You have a brief statement which you would like to make preliminarily to being asked some questions?

Mr. GWYER. Yes; I do, Mr. Chairman.

Senator KEATING. Proceed, Mr. Gwyer.

Mr. GWYER. Only a few days ago Nikita Khrushchev bared before the world the goals of the Soviet Union for the next 20 years. Viewing his boasts, we cannot escape the conclusion that we are today engaged in an all-out economic war with the Soviet bloc nations and that these nations gave themselves 20 years to make good their boast in this death struggle for world supremacy.

And examination of historical facts points out many errors of judgment committed by the Western European nations as well as the United States. The United States and Western Europe have helped tremendously in building the U.S.S.R. which today is threatening us

with political destruction. I think it would be proper at this time to quote to you a statement from Lenin, made in 1920 before the Eighth All-Russian Congress of the Soviets. In referring to the trade with foreign countries, he said that in order to obtain all sorts of equipment, it will be necessary to bribe the capitalist nations with the bait of profit. The all sorts of equipment which the Soviets will thus obtain will permit them to raise themselves on their feet and then defeat these capitalist nations in an economic war.

This statement of intentions was successfully carried out during the 1920's and 1930's and is being carried out with considerable success today. In the early 1920's, by granting mineral concessions, the Soviets obtained from the United States and from other countries key types of industrial equipment, plus trucks and tractors for their agriculture. The services rendered by the French industry in early days of Soviet aviation were great. French manufacturers shared with Americans the credit of helping the Soviet Union to build its airpower. The Italians provided the Soviets with Fiat cars, airplane engines, dockyard equipment, and ships. Germany, to a large extent, became responsible for building up the Soviet machine tool industry. The first Soviet watch factory began functioning with the machinery purchased from the United States. Americans were also busy developing one of the largest Soviet iron and steel centers at Magnitogorsk. They also were instrumental in organizing and supervising the work on the largest hydroelectric dam in Europe, at that time the largest on the Dneiper River. The American know-how and equipment were largely responsible for erecting the largest Soviet automobile plant at Gorky. These are but a few examples where western interests contributed greatly to the growth of the Soviet industrial might.

During World War II, the almost unlimited help extended by the United States to the Soviet Union involved, besides supplies of purely military character, equipment of industrial nature. It is estimated that of the approximately $11 billion worth of goods shipped to the Soviet Union up until 1947, between $\frac{1}{2}$ billion and $1 billion was accounted for by equipment of purely industrial nature, for example, machine tools of all sorts, processing equipment, et cetera.

During the last 2 or 3 years, visitors to the Soviet Union, having the opportunity to visit some leading Soviet industrial plants, casually reported observing American machine tools still being used.

Much has been said about the Soviet progress since the end of World War II. Most of the reports on the subject deal basically with the positive attainments by the Soviets. Since 1957, the era of sputniks created an impression that the progress in the fields of science and technology by the Soviets is so great that it almost equals that of the greatest industrial nation of the world, the United States. Researchers on the Soviet Union tended to overemphasize her positive gains, completely sidestepping the critical areas which are still abounding in the Soviet industrial system. Attempts to publish material of a critical nature were usually nullified by a stereotype answer by some publishers, that critical appraisals of Soviet deficiencies only create a false sense of complacency on the part of the American reader.

The truth is that Soviet attainments are basically in areas which can be described as propagandawise spectacular and as a rule have only military or paramilitary application. The industry as a whole,

apart from the military areas, is plagued by chronic deficiencies. The area of machine tool production, so closely related to the overall mechanization and automation of industrial processes, is a case in point.

Senator KEATING. Thank you very much, Mr. Gwyer.

There was one statement in your presentation that I would like to ask you about, if you can shed any light on it.

In the first page of your statement you say, in referring to the trade with countries, Lenin said that "in order to obtain all sorts of equipment, it will be necessary to bribe the capitalist nations with the bait of profit."

Can you shed any light on why it is that the Soviet Union should come to the United States for synthetic rubber and pay more per pound than similar rubber could be purchased for in Western Europe, for instance, in Italy, on which we have some evidence now? Can you explain in any way why that would be so?

Mr. GWYER. Mr. Chairman, basically the Soviet aims are twofold: First, by placing an order on the American market, despite the fact that they have to pay a higher price per ton or unit of measure, they may set up a precedent. First, in terms of trying to loosen an item from the Battle Act list, if this synthetic rubber is on the Battle Act list, and then in setting up a contact, a commercial contact, with American industry.

American industry was always in a position to deliver twice or three times as fast as European counterparts. Consequently, you have a gain for the Soviets in terms of time element involved.

Second, the fact that an order was placed with the United States, thus serving the purpose of establishing commercial contacts or commercial pipelines to the United States.

Senator KEATING. I think that is very helpful.

Counsel?

Mr. SOURWINE. Following that inquiry by the chairman, may I ask if, in your judgment, the mere existence of trade relations with the United States and the purchase of various items from the United States gives the Soviet Union a propaganda poll; does it do them any good propagandawise to have the world know they can buy here?

Mr. GWYER. There is no question about it. The fact that the order was obtained, if it was obtained from the United States, would serve as an example for the Western European nations to look for U.S. leadership in this area for expanding commercial trade with the Soviet Union.

Mr. SOURWINE. Mr. Chairman, the question was raised with the Lenin statement about bribing capitalism with extra profit. We have the precise text of this particular statement, one paragraph and, perhaps it might be offered for the record at this time.

Senator KEATING. It will be received.

The statement follows:

Lenin stated in his "Report on Concessions" delivered on the 21st of December 1920, the following:

"It is necessary to bribe capitalism with extra profit. Capitalism will get the extra profit—God with it (begone), with this extra profit—and we will get the basics (equipment) with the aid of which we will strengthen ourselves, will finally get up on our feet and then defeat it (capitalism) economically."

Mr. SOURWINE. Mr. Gwyer, do you have information respecting the publication of misinformation about Soviet production in technical publications in the United States?

Mr. GWYER. Yes; I definitely do.

Mr. SOURWINE. Will you go into that, please, at this time, in your own words?

(Persons named by Mr. Gwyer and representatives of publications to which the witness referred were sent excerpts from his testimony and invited to comment. The replies received are printed as app. IV at p. 94.)

Mr. GWYER. Perhaps the best illustration of misinformation may be gleaned from correspondence I had with two officials, one an official of an American machine tool distributors association; the other one with the editor of a leading trade publication here in the United States: McGraw-Hill's American Machinist.

When I published my article on Soviet machine tools in 1958 I received a letter from the west coast—I think you have that letter as one of the exhibits—a letter signed by Mr. James O. Ellison, in which he states——

Senator KEATING. Who is Mr. James Ellison?

Mr. GWYER. He was, in 1958, president of the American Machine Tools Distributors Association, if I have the correct title of the association. In his letter he says that his views are directly opposite to mine, because the information he gathered from American publications is that the Soviets do have these tools, which I questioned in my report.

In 1958 also, in December, I was invited to a meeting on the Department of Commerce grounds, for the purpose of hearing results of a survey made by McGraw-Hill Publications. This is a machine tool survey in the United States.

After the end of the presentation by Mr. Burnham Finney, the editor of American Machinist, a McGraw-Hill publication, I had a very brief chat with him, and I told him that I was working on a paper which I think he should consider for publication by American Machinist, because the paper would deal basically with the machine tools in the Soviet Union, the existence of certain types of machine tools, the extent to which they affect the degree of mechanization and automation, and so on.

He indicated great interest in my proposal, and suggested that I send the draft of the paper at the nearest possible time, the nearest opportunity. I finished the paper in December of 1958, and I mailed the paper to the publisher just before the end of the year. If I can recall, it was either the 29th or 30th of December 1958.

I hadn't heard from him for about 6 weeks. Consequently, I phoned to his office in New York, and inquired, "You exhibited interest in my paper, and in the last 6 weeks I haven't received a reply from you."

So he indicated to me that he will follow through with the letter.

I received the letter, in which he acknowledged the receipt of the paper. He stated also that he has a competent editor rewriting the paper in order to conform to the journalistic style of the American Machinist since my paper was a purely academic paper, with each statement documented. He also indicated that he was going to drop most of the references I made to every single statement I made or

whatever claim I made, and also that the paper will be scheduled for publication some time in April of 1959.

I think it was the middle of April of 1959 when I received a letter from Mr. Finney in which he said that "We do regret, but we are pulling this one here out of print."

I think the exact phraseology he used, he said, "We are pulling it out from our issue," I think May 3 or May 4 of 1959.

Then he said that, although he was in favor of publication of this paper, there was a divergence of views on the editorial staff of the American Machinist.

As a result of deliberation, finally they decided against publication, and one of the reasons he cited in his letter to me was that—

we had competent people go to the Soviet Union, they have observed the Soviet industry, they observed machine tool plants and, consequently, they have in the past published a number of articles dealing with the subject.

Furthermore, he added that merely critical appraisal of the deficiencies existing in the Soviet Union will have a tendency to create a complacency on the part of the American reader.

I have obtained copies of the articles written by the two individuals he referred to in his letter, and I found out that both of them are Britishers. They are the editors or associate editors of the McGraw-Hill publication in London, a counterpart of the American Machinist in New York, and that these people visited the Soviet Union sometime during either 1956 or 1957, and their views were not too well accepted by the British reader.

If I can quote directly, the British were alarmed and flabbergasted by the statements made by these two individuals. I think one of them is Mr. Trippe, the other one is Mr. Stubbs, both of them editors of the McGraw-Hill publication in London.

Some publications in England, judging from the tone of their editorials and their comments, classified these two individuals as definitely spreading pro-Soviet propaganda in Great Britain.

I presume that, perusing through the collection of all of these articles which I have included as one of the exhibits, you will find definite propaganda line by the Soviets: First, trying to sell to the Western World, especially Western Europe in this case, the fact that the Soviet industry, the machine tool industry specifically, is all powerful; that they produce a large quantity of machine tools, that the technology embodied in these machine tools is equal, perhaps, or may be even superior to that of the West.

Furthermore, these two editors indicated that the productive capacity of these machine tools and efficiency as a whole in producing them is much greater than that of Great Britain. Of course, this was the point which the British reader immediately disputed.

Furthermore, they advocated liberalization of trade between the Soviet Union and Western Europe, and I think there is a list in one of the articles, of items which the Soviets, despite the claims of having the capability to manufacture these machine tools, were trying to obtain from Western Europe.

Mr. SOURWINE. Mr. Chairman, at this point it might be well to get some of these exhibits that are mentioned actually into the record.

I show you three letters addressed to you on the letterhead of the American Machinist, all signed by Mr. Burnham Finney, the dates

being respectively, March 12, April 3, and April 15, 1959, and I ask you if these are the letters which you actually received and to which you referred here?

Mr. GWYER. This is the one I would like to quote, because I would like to put this on the record——

Mr. SOURWINE. First, before you quote it, let us just identify them. These are the letters that you receive?

Mr. GWYER. Yes, sir. These are letters I have received, and they are addressed to me, and this is a communication between myself and Mr. Finney.

Mr. SOURWINE. These are communications from Mr. Finney to you, are they not?

Mr. GWYER. Correct.

Mr. SOURWINE. May I ask that these three letters go in the record, Mr. Chairman?

Senator KEATING. Yes; they will be received.

(The documents referred to were marked "Exhibit No. 1, No. 1–A, and No. 1–B" and read as follows:

EXHIBIT No. 1

AMERICAN MACHINIST,
New York, N.Y., March 12, 1959.

Mr. JOSEPH A. GWYER,
Washington, D.C.

DEAR MR. GWYER: I am sorry indeed about the delay in publishing your article on Russia.

It was not possible to use it in February because we are doing an extensive rewrite of it and the staff member who has the assignment has been jammed with an emergency job.

He will have the revision ready, however, next week and will ask you to take a look at it. I should say that the article will appear in either the first or second April issues.

I am sure that you will agree with me that the revised article is much easier to read than the original.

Before long you will receive a check for $100 in payment for your article.

With my best regards,

Sincerely,

BURNHAM FINNEY, *Editor.*

EXHIBIT No. 1–A

AMERICAN MACHINIST,
New York, N.Y., April 3, 1959.

Mr. JOSEPH A. GWYER,
Washington, D.C.

DEAR MR. GWYER: I am enclosing the rewrite of your article on Russia and hope that you will agree with me that it has been tightened up a lot, shortened, and made more readable.

The article as originally written was entirely too long and had to be condensed somewhat to get into available space. Even as it is, it will take four pages, and we publish few articles that long.

For space reasons, we have been forced to take out the footnote references appended to your original manuscript. We feel that we have covered this omission adequately at the beginning of paragraph 6 on page 1, which reads: "For the answer we must go to the Russians themselves, to their technical magazines and literature." Anyone who wishes the exact references—and I doubt if anyone will—can write us after reading your article.

You will notice that we have not used the Russian spelling of names but have substituted the English version instead. "Gorkky" is an example. We have referred in previous articles to the Gorky automobile plant, so we are being consistent.

Your article is scheduled for publication in our issue of May 4. Therefore I would appreciate your going over the rewrite immediately and if you detect any errors or wish to make any criticisms or suggestions, please write me without delay.

I feel sure that your article will be the subject of considerable comment.

Sincerely,

BURNHAM FINNEY, *Editor.*

EXHIBIT No. 1–B

AMERICAN MACHINIST,
New York, N.Y., April 15, 1959.

Mr. JOSEPH A. GWYER,
Washington, D.C.

DEAR MR. GWYER: I am sorry to have to tell you that we finally have decided not to publish your story on the Soviet machine tool situation. I therefore am returning to you herewith your original manuscript and the rewritten version of it. You are free to submit either one, as you may see fit, to another magazine for possible publication. You also are entitled to retain the honorarium which, I believe, you already have received.

From the time that we first received your manuscript there has been a division of opinion within our staff as to the desirability of publishing it. I personally was in favor of it and even had a competent staff editor spend many hours rewriting it. Just in the past 10 days I have had misgivings about publishing the story and the decision now against it is irrevocable. We therefore are pulling it out of our issue of May 4.

Two years ago we published a series of eight articles on the Russian machine tool and metalworking industries, the first printed anywhere on the subject. This series covered a considerable portion of the general facts in your article, but obviously went far beyond your facts because our author actually visited a number of Soviet plants and saw conditions for himself.

From our knowledge of what Russia is doing, based on visits of our own people plus talks with others who have been there, we believe it a mistake to publish an article such as yours which merely is critical of Russian accomplishments and tends to lull the reader into a sense of false security about Russia's advances in the years immediately ahead.

I appreciate your having sent us the manuscript in the first place and I regret the length of time that has passed before this final decision was made.

With my best wishes

Sincerely,

BURNHAM FINNEY, *Editor.*

Mr. SOURWINE. If you want to read from one of them, identify the letter you are reading from.

Mr. GWYER. I want to quote a paragraph here saying that:

From our knowledge of what Russia is doing, based on visits of our own people plus talks with others who have been there, we believe it a mistake to publish an article such as yours which merely is critical of the Russian accomplishments and tends to lull the reader into a sense of false security about Russia's advances in the years immediately ahead.

Mr. SOURWINE. There are two sides to that coin, aren't there? While there may be an argument that if you say something derogatory about the Russian machine tool industry, you are lulling the American people into a false sense of security, as he indicates, isn't it also true that if we accept the thesis that the Russian machine tools industry is a very progressive one and has accomplished at least as much as we have, then we remove an argument against shipping our machine tools to Russia?

Mr. GWYER. I believe that this is one of the factors which has to be considered very seriously because, to some extent, the limitations on export of certain types of technological know-how rest on the fact that we know that the Soviets do not have this type of technological

know-how; and, in opposite, whenever we know than an item is available in commercial quantities, consequently, the value of it as a strategic item ceases to be of paramount importance.

Mr. SOURWINE. Mr. Gwyer, you mentioned correspondence you had with Mr. J. O. Ellison.

Mr. GWYER. Yes.

Mr. SOURWINE. I show you a letter to you signed by Mr. Ellison dated November 17, 1958; a letter from you to him dated March 27, 1959; and a letter from him to you dated March 31, 1959, and I will ask if this is correspondence in which you participated? These letters are from your files, are they not?

Mr. GWYER. Yes, sir; these are the letters which I have exchanged with Mr. Ellison.

Mr. SOURWINE. I offer these for the record, Mr. Chairman.

Senator KEATING. They will be received.

(The documents referred to were marked "Exhibit No. 2, No. 2–A, and No. 2–B" and read as follows:)

EXHIBIT No. 2

HARRON, RICKARD & MCCONE CO.,
OF NORTHERN CALIFORNIA,
San Francisco, Calif., November 17, 1958.

Mr. JOSEPH A. GWYER,
The Adjutant General's Office,
Washington, D.C.

DEAR MR. GWYER: I have read with considerable interest your article in the current issue of Ordnance under the title "Soviet Machine Tools." Your opening remark that machine tools are of central importance to the achievement of military capabilities demonstrates an understanding of machine tools which I hope is shared by many people in our military establishments.

Due to the fact that the machine tool industry is so small by comparison with other industries in our country, it is not generally understood by very many people outside of the industry.

While I find your article to be an exceptionally well documented observation based principally upon statistics as available in the Library of Congress, I feel that your assumptions are almost diametrically opposite to the opinion of we who are in the machine tool industry. I hope that my remarks will not be taken as critical which is certainly not my intention.

Specifically your conclusion that "despite the Russian gain in statistical numbers, the Soviet Union still remains and will remain for some time to come well behind the United States in machine tool production" might have been plausible had the industry remained static in the proportions which you referred to in 1955. However, this has not been the case and since you did not point out the rather tragic decline in machine tool production in this country since 1955 I am curious to know whether or not you are aware of it and if you are aware of the fact that the Iron Curtain countries in the year 1958 will produce possibly five times as many machine tools as we will in America.

The leaders in our industry who have had the opportunity to see Iron Curtain machine tools in the year 1958 draw the conclusion that in many cases they are equal to ours although, on a broad base, we still enjoy some degree of superiority in the productivity of our machines but nothing in the magnitude of 5 to 1 nor 3 to 1.

It occurs to me that a much more realistic appraisal of the subject is in order and without burdening you with unsolicited details I want you to know I would be very happy to respond to any specific questions you may have and to tell you that in my opinion I could make information available to you based on my knowledge of this general subject as it applies to American machine tools which could substantially alter the impression which I believe you have left with other of your readers.

If you do choose to respond, it would be most helpful to me to have you expand on your remark that it is not the purpose of your survey to awaken the

uninterested or those who underestimate the Soviet industrial capacity. There may be an underlying justification for this statement which escapes me and I would consider it a great personal favor to have that point explained.

I shall look forward with keen interest to your reply.

Yours very truly,

J. O. ELLISON.

EXHIBIT No. 2–A

WASHINGTON, D.C., *March 27, 1959.*

Mr. J. O. ELLISON,
Harron, Rickard & McCone Co.,
San Francisco, Calif.

DEAR MR. ELLISON: I am really sorry about the delay in replying to your letter of November 17, 1958, which eventually reached me the last week of December I was planning to write to you then and I hoped to include a reprint of a study on Soviet mechanization programs which I submitted to the American Machinist during the last days of December. As you can see from Mr. B. Finney's letter, the study is still in the mill, hence the delay.

A reexamination of my conscience tells me that I owe you at least a reply without going into a polemic on the merits or demerits of my study of Soviet metal-cutting machine tools. To be frank with you, I do admit that since 1955, the relative position of the U.S. machine tool manufacturers worsened, to put it mildly, and the industry as a whole can be described in the jargon of industrial economists as a "sick industry." Since the purpose of my study was to determine the Soviet strength or weaknesses in this respect, I have not taken into consideration the cyclical movements of the American machine tools industry which is extremely sensitive to the ups and downs of the business cycle.

During the past year and even perhaps now, the Soviet industrial strength or weaknesses are being exploited for either political or economic reasons. Some circles tend to underestimate Soviet industrial capacity and some go to the extreme of swallowing Soviet industrial propaganda hook, line, and sinker, accepting Soviet claims to industrial prowess at face value.

I personally do not subscribe to either approach, since in my judgment both are wrong and harmful. Subjectivity in lieu of objectivity, despite certain political or economic gains, however lasting, generates seeds of disaster, and this is the reason for my cryptic remark that I do not want "* * * to placate the 'alarmist', who daily both extols and bemoans Soviet industrial strides, nor to awaken the uninterested or those who underestimate the Soviet industrial capacity."

Please return the enclosed study, since this is the only draft I have available.

Sincerely yours,

JOSEPH A. GWYER.

EXHIBIT No. 2–B

HARRON RICKARD & MCCONE CO.,
OF NORTHERN CALIFORNIA,
San Francisco, Calif., March 31, 1959.

Mr. JOSEPH A. GWYER,
Washington, D.C.

DEAR MR. GWYER: Your letter of March 27 is much appreciated. Since that time I find that we have several mutual friends from whom I have learned a little more of your very interesting background. It was very thoughtful of you to send me the draft of your article which is to appear in an early issue of "American Machinist."

In the hope of becoming better acquainted with you and having the opportunity to discuss the subject of Russian machine tools with you in person. I shall refrain from any detailed comment on your draft of the new article. It might be fair, however, to say that the general impression which I think the readers will gain from this article will not be a very accurate reflection of the true position of the Russians and their machine tool capacity. It appears to me that you are describing the Russian machine tool capacity as being considerably more disorganized and less effective than it actually is. I do not challenge the interpretation which you have made of your source material but I would say the

source material as such is about 180° opposite to some of the other studies which have been made of Russian machine tool capacity and which have appeared in print recently.

I think of one article in particular which appeared in "American Machinist" which would be very contradictory of some of the statements in your proposed article. The statement that in all of Russia there are no more than 100 automated lines in use today would be one of the most contradictory statements.

I hope you will not gain the impression that I have any personal desire to take issue with you for personal reasons. On the contrary I suspect that we both have a very great concern over the relative position of our own machine tool industry in America and that of the Soviets. This is attested to by your closing sentence which ends with the word "disaster."

It occurs to me that any information disseminated on Russian machine tools at this time should be as accurate as possible because any inaccuracies will tend to favor one or the other of the extremes which you mentioned in your letter of March 27. I for one hope that the day will come in the near future when a more accurate appraisal of their position will become known in this country.

Thanks again for the material which you have sent me. You will find it attached as you requested.

Yours very truly,

J. O. ELLISON.

Mr. GWYER. Mr. Chairman, may I quote from the letter of Mr. Ellison to me?

Senator KEATING. Now again, just remind me who is Mr. Ellison?

Mr. GWYER. Mr. Ellison is a machine tool distributor, he is associated with Harron Rickard & McCone Co. of Northern California. In 1958 he was president of the American Machine Tools Distributors Association.

Senator KEATING. Yes; you may quote whatever you think is essential.

Mr. GWYER. This is a letter dated March 31, 1959, and he says, and I quote:

I do not challenge the interpretation which you have made of your source material but I would say the source material as such is about 180° opposite to some of the other studies which have been made of Russian machine tool capacity and which have appeared in print recently.

Senator KEATING. You do not know what he is referring to there, whether he is referring to the statements in the British counterpart of the American Machinist?

Mr. GWYER. To continue this letter, he says:

I think of one article in particular which appeared in American Machinist which would be very contradictory of some of the statements in your proposed article. The statement that in all of Russia there are no more than 100 automated lines in use today would be one of the most contradictory statements.

Senator KEATING. That statement was in your article?

Mr. GWYER. Yes; correct.

Senator KEATING. Is that statement true today or would you update that some now?

Mr. GWYER. Today I would say that the Soviet Union has less than 200 transfer machines in operation, and this is borne out by evidence as presented by Soviet trade journals.

Senator KEATING. And for some of us less schooled in this field, a transfer machine is what brings about complete automation, is it?

Mr. GWYER. Yes. It is a system of operations where a semifinished product undergoes machining and, at the end of the line, emerges as a completely finished product ready for assembly.

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During the machining processes, the gaging is done automatically; consequently, there is no human hand touching this specific item during all the machining operations.

Senator KEATING. And in Soviet Russia, in the Soviet Union, you would say there would be less than 200 in all kinds of industry of such machines in operation?

Mr. GWYER. Yes. Most of the Soviet transfer machines are used by the automotive industry in the Soviet Union. There are very few outside. But basically the automotive industry is the primary user of the transfer machine, as we understand it.

Senator KEATING. As a standard of comparison could you give us any idea of what the comparable figures would be in this country?

Mr. GWYER. I would venture not a guess but an estimate based on the machine tool survey made by McGraw-Hill which was discussed in December 1958, during the meeting with Mr. Burnham Finney.

On one of the pages he had the quantity of in-line automatic lines, transfer machines, as we understand it. There is a reference to approximately 8,000, the bulk of which are used by the automotive industry.

Senator KEATING. In this country?

Mr. GWYER. Yes; and he has also a figure of 8,000 rotary machines, which differ in a sense in that an item moves more or less in a rotary fashion.

Senator KEATING. I am trying to arrive at a figure comparable to the estimate of the figure of 200 which you gave us for Russia. Would the comparable figure be 8,000?

Mr. GWYER. I would venture a guess, and I would say it is a calculated guess in the sense I do not have the exact figures and, perhaps, these figures may be misleading. I don't have this reference here at my elbow, but I think this could be very easily ascertained.

Senator KEATING. All right, Counsel.

Mr. SOURWINE. If you are through with those documents, let the reporter have them.

I show you now an issue of Metalworking Production, a weekly journal on plant and production engineering. Have you seen this before?

Mr. GWYER. Yes, I have.

Mr. SOURWINE. Do you have some comment that you wish to make in connection with this publication?

Mr. GWYER. Well, as I indicated before in my testimony, this is a Russian survey dealing basically with the Soviet machine tool industry.

Mr. SOURWINE. There is a particular item in there which is such a survey, is it not? Is the whole publication a Russian survey?

Mr. GWYER. Yes; the entire publication deals with the Soviet machine tool industry. Actually it is a collection of articles which appeared in this British publication over a period of time, and some of these articles were used by the American Machinist here in this country.

Mr. SOURWINE. You say this is a Russian survey. You mean it is a survey of the Russian——

Mr. GWYER. Of Soviet machine tool industry, prepared by Norman Stubbs, editor, and Peter Trippe, associate editor, Metalworking Production, which is a British McGraw-Hill publication.

Mr. SOURWINE. Is this the publication which you indicated was regarded by some as containing Soviet propaganda?

Mr. GWYER. Yes, it is.

Mr. SOURWINE. Are there any particular portions of this publication which should be in our record verbatim, or is it sufficient if the entire publication is put in the record by reference and held in the committee files?

Mr. GWYER. Well, I would hesitate to recommend inclusion of the entire book since there is a limitation as to how much material you can place in the record.

Actually, every single article contains distorted information and, perhaps——

Senator KEATING. When you say "distorted," you mean distorted in the manner of painting the Soviet industrial potential as greater than it is?

Mr. GWYER. Yes; that is correct.

The portrayal of Soviet machine tool plants is, perhaps, out of focus. They are uplifting, they are building up the facade, let us put it this way.

Mr. SOURWINE. Mr. Chairman, I think the witness ought to be asked to document this. Might I ask that the order be entered that the witness be given time to examine this carefully and prepare for the committee excerpts from the article or articles in this publication which he considers to be misleading, with his own statements and sources to show how they are misleading?

Senator KEATING. You could do that for us, couldn't you? Not now, I don't mean for you to do it now, but I mean if you had a little time for it, you can do it?

Mr. GWYER. Oh, yes, definitely. It is very easy.

Senator KEATING. All right.

Mr. SOURWINE. If this may be done, if the order could be that this study when it is presented to the committee could go into the record at this point?

Mr. GWYER. Correct.

Senator KEATING. That will be so ordered.

(The information referred to was marked "Exhibit No. 3" and reads as follows:)

EXHIBIT No. 3

(Mr. Gwyer's statement regarding the matters in the Russian survey published by Metalworking Production, is as follows:)

METALWORKING PRODUCTION'S RUSSIAN SURVEY, BY NORMAN STUBBS, EDITOR, AND PETER TRIPPE, ASSOCIATE EDITOR, METALWORKING PRODUCTION, BRITISH MCGRAW-HILL PUBLICATION, NOVEMBER 1956–MARCH 1957

This survey deals with the machine tool and metalworking industries in the U.S.S.R., in all their aspects. The reports were prepared by Metalworking Production editors, following personal visits to the U.S.S.R. Mr. Norman Stubbs was in Moscow in August 1956 and Mr. Peter Trippe visited Moscow in November 1956.

Of the 10 articles presented in this Russian survey, the following were either fully or in part published by the American Machinist (New York).

Title in Russian survey	Pages	Author	Date and pages in American Machinist
Some First Impressions From Moscow	3+	N. Stubbs	Nov. 19, 1956, pp. 121–124.
Metalworking and the Sixth Five-Year Plan	11+	do	Dec. 3, 1956, pp. 137–140.
Soviet Research and Development	31+	do	Dec. 17, 1956, pp. 116–119.
The Moscow Automatic Ball Bearing Factory.	39+	P. Trippe	Jan. 14, 1957, pp. 147–154.
Machines by the Thousand	62+	do	Feb. 11, 1957, pp. 146–150.
Special Machines in Less Than Nine Months.	83+	do	Feb. 25, 1957, pp. 178–181.
Grinding Plant To Have an Automated Line.	101+	do	Mar. 11, 1957, pp. 166–168.
The Man Behind the Machine	113+	do	May 6, 1957, pp. 168–170.

One article under the heading "The Embargo and the U.S.S.R." prepared by Norman Stubbs did not receive a mention from the American Machinist. This article appearing on pages 21 to 28 of the Russian survey deals with machine tools that are in short supply. It also goes into the political ramification of the embargo, which appears to hamper to a large degree the Soviet drive for greater industrial development.

Here is a quotation from page 22 of the survey:

"* * * it is not surprising that many of those interviewed spoke strongly about the embargo. There is no doubt that the embargo is a major thorn in the Soviet's side. All our contacts were friendly enough, and our reception everywhere was most cordial, but they made it perfectly plain that they regarded the embargo an affront. A significant slant on this question was given by the head of Stanko-Import, which is the export-import organization. He quoted a case where sale of machines from a firm in England were banned under the embargo. But, he said, they were able to obtain similar machines from Switzerland. Clearly, such substitutions would amount to a mere drop in the ocean compared with the Bulganin-Khrushchev £1,000 million shopping list. (See M.P., May 4, 1956, p. 493.) Metalworking production needs in this list are tabulated opposite. And that list, he pointed out, was only one of machines in which they were most interested—not necessarily from the United Kingdom. It certainly did not represent their total requirements.

"It will be recalled that this list represents part of the Bulganin-Khrushchev £1,000 million trade proposition which was announced earlier this year. This proposition would involve orders worth something between £360 and £450 million for the engineering industries alone, for delivery between 1957 and 1960. The huge demand for machine tools includes £27 to £36 million worth of transfer machines. As the position stands at present, of course, practically all the machine tools which the U.S.S.R. would like to buy are prohibited by the embargo, and where this does not apply, it is difficult to see how, with our own home commitments, we could supply more than a small percentage of requirements with existing capacities. The call for transfer machines and multi-unit-head machines, which are not covered in the embargo, indicates the tremendous drive which the U.S.S.R. are making in the field of automation, because their own production is considerable and has a high priority in the present plan. Further, they are actively engaged in advanced designs and in the development of standardized unitized machines which will doubtless widen the scope of automation well beyond that of the made-to-measure transfer machine. But their own rapidly expanding capacity in this field, considerable though it is, does not seem to be enough, and they would be most willing to buy from us to supplement their own output * * *.

"* * * There is no doubt that the U.S.S.R. consider the embargo as an affront, but they maintain that it would not embarrass them in carrying out the plan; we were told that the plan had taken such a possibility into account. This list shows some of the equipment they are seeking to buy in the metalworking fields.

"Metalworking Equipment Needs

Metal-cutting machine tools:	
Transfer machines	£27–£36m
Special and multiple head machines	500
Grinding machines:	
Planetary	40
Gear cutters and shavers	50
Optical profile [1]	40
Thread [1]	40
Broach and spline	80
Gear cutters (up to 160-inch diameter) [1]	10
Gear planers (up to 64-inch diameter) [1]	25
Profile millers, multispindle [1]	25
Universal pattern milling machines	100
Jig borers [1]	45
Relieving lathes	47
Thread milling machines [2]	20
Autolathes, 4 and 6 spindle [1]	40
Metal-forming machine tools:	
Mechanical "Maxi" presses, capacity 6,000 tons [1]	30
Mechanical "Maxi" presses 500-2,000 tons [2]	70
Extruding presses, capacity 15,000–25,000 tons [1]	2
Hydraulic forging presses, capacity 3,000–15,000 tons [1]	10
Drophammers, double action steam or air, falling weight 4–6 tons [2]	50
Drophammers, steam or air, falling weight 15 tons [1]	3
Plate and section straightening machines	16
Bolt, cold heading machine ½ inch capacity up	70
Nut-forming machines	70
Foundry equipment:	
Automatic 4-cycle molding machines	140
Automatic sand mills	11
Shell molding machines	50
Automatic core-blowing machines	300
Boxless molding machines	140
Molding machines, in the line	100
Molding machines, capacity 100 boxes per hour	70
Core makers	65
Full automatic 5-station core-blowing machines	100
Universal core-blowing machines	130
Molding machines for boxes of 1.5m. x 1.5m. capacity 20 and 40 tons	20

"[1] Complete embargo.
"[2] Partially embargoed, part subject quantitative control. Other items can be exported freely."

There is a definite attempt to minimize Soviet deficiencies and shortcomings, magnify out of proportion Soviet achievements, how limited they may be.

The following quotations are typical phrases abounding throughout the entire survey.

"* * * at this stage it is sufficient to say that, in our experience, these organizations are on a fantastic scale and are quite unlike anything we know in this country * * *."

"* * * the machines in general, have an air of quality about them—notably the lathes and millers and the few grinders that are on display. * * *"

"* * * but, with reference to copying, it must be said plainly that the U.S.S.R. are indeed showing increasing originality in design. We and they may look at the embargo in various ways. But one thing it undoubtedly is doing is to stimulate Soviet production of machine tools and, one may be sure, the design of new and better machine tools, and that they would do anyway * * *."

"* * * the Russians, by their own reckoning, are unable yet to produce anything like the quantity of machine tools that they could very well use today. But it was our impression that their industry is speedily filling the gaps in the types and sizes of machines available, and they already have some designs of their own that are quite unique. * * *"

"* * * in short, it seems fair to say that automation in Russia today, is generally more broadly based than in the West. In some respects it is further advanced. In others it is behind, and notably so in those promising numerical control of the punched card or tape type. Even so, development of those devices, too, is undoubtedly in train—and they could come along quickly. * * *"

"* * * The automatic ball and roller bearing factory in Moscow is the most advanced production unit of its kind in the world. * * *"

"* * * It has been implied in articles in the Western press dealing with automatic factories in the Soviet that these projects are showpieces. To believe that would be a very dangerous rationalization, for it would seriously underestimate the ability of Soviet engineers in the production engineering field, and we might well find ourselves left standing in the race for production * * *. This factory [bearing] is no showpiece—it has been planned and put in operation on a purely realistic basis. It is a practical working unit, and it is the shape of things to come * * * ."

"* * * We can vouch for their efficiency in their operation * * * ."

"* * * There is, clearly, a danger in assessing the quality of another country's machines in terms of one's own production standards. We would be most unwise, probably, to make machines with as little supervisory control. But in these plants, it seems to work * * * ."

"* * * But talking with Soviet engineers, there was never a mention of politics unless one includes the embargo discussed in sorrow more than anger * * * ."

"* * * In this plant again [Sverdlov in Leningrad] was evidence of the change that has taken place since the beginning of the war, and, even more markedly in the years since the war. Nearly all the old machines are of British, American, or continental extraction, while the few replacement machines are Soviet built. They have clearly made up their minds, embargo or no embargo, to rely on their own resources, although it seems certain they would buy if they could get reasonable delivery periods. * * *."

"* * * Russians don't drink unless they are proposing a toast * * * ."

"* * * We had many frank discussions, and no punches were pulled on either side—and both sides enjoyed it thoroughly. The words most commonly heard were 'peace,' 'interchange' and 'understanding.' One, or all, of them figured in the toast at every lunch and dinner we attended—and there were quite a number of them. It is easy to say that these were simply diplomatic lipservice, but—in our experience anyway—it simply wouldn't be true. * * *"

"* * * The social side of Soviet plants is surprisingly similar to our own * * * ."

A rebuttal to the exaggerated claims made by both N. Stubbs and F. Trippe can be readily found in statements by responsible Soviet officials cited in two studies I have introduced in the record. These two studies are "Appraisal of Soviet Mechanization and Automation" and "Soviet Metal-Cutting Machine Tools: Assertions and Facts."

Senator KEATING. Let me ask, with reference to these 200, roughly, transfer machines: We have rather recently shipped transfer machines to the Soviet Union, haven't we?

Mr. GWYER. I am not aware of actual shipment.

Senator KEATING. You are not aware of it?

Mr. GWYER. Judging from the information that was published over the period of the last 5 or 6 months, there is a consideration involved. but I don't think there was any actual shipment of transfer machines to the Soviet Union.

Senator KEATING. They have requested the shipment of transfer machines?

Mr. GWYER. Yes, I presume there is an application, and I think this can be ascertained by glancing over some of the material that was published during the last 3 or 4 months.

Mr. SOURWINE. Might I suggest, Mr. Chairman, we hold this as an item to ask the departmental people about when they come up here.

Mr. GWYER. Mr. Chairman, since we are on the subject——

Mr. SOURWINE. Yes.

Mr GWYER (continuing). ——of individual instances where there is a conflict of information and how the information which is published in this country affects the thinking on the part of the reader, in line with the two letters I introduced as evidence, I would like to bring also for the record a statement made by the Director of the Central Intelligence Agency in reference to the production of machine tools in the Soviet Union and in the United States.

Senator KEATING. Is this in the form of a letter to you?

Mr. GWYER. No. This is taken from an address by Allen Dulles, Director of Central Intelligence, to the Edison Electric Institute, New Orleans, La., April 8, 1959, 2:30 p.m. central standard time. "The Challenge of Soviet Power."

On page 9 of the release, in reviewing some of the factors that make up Soviet industry, Mr. Dulles refers to the following:

> Here are a few examples: While the Soviets last year were producing only 1 automobile for every 50 we produced, they are turning out 4 machine tools to our 1.

Now, I don't think it is an intentional misstatement of fact, but comparing the total production figures for the Soviet Union and the United States, Mr. Dulles employed here an apple and orange technique. Where the totals for Soviet Union included all types of machine tools, light garage and hobby type variety, light industrial types, and heavy industrial types manufactured during that year, I think they produced about 135,000 of them in 1958 and for the United States he assumed the figure of 35,000, all of them heavy industrial type machine tools.

Senator KEATING. In other words, if he had used the heavy industrial type for Russia——

Mr. GWYER. For the United States, sir, heavy industrial types for the United States only and all machine tools for the Soviet Union.

Senator KEATING. My question is, if he had used only the heavy industrial types for the Soviet Union as he did for the United States, what then would have been the result?

Mr. GWYER. The figures would be not only 50 percent lower but I presume would be almost on a par with that for the United States.

Senator KEATING. Would be what?

Mr. GWYER. Would be equaling those of the United States.

Senator KEATING. In other words, they were producing equal to the United States in heavy machine tools.

Mr. GWYER. Yes; I do agree. But the ratio is not 4 to 1, but rather 1 to 1.

Senator KEATING. 1-to-1 rather than 4-to-1.

Mr. GWYER. Yes.

I should add to this one here again a misstatement, and this appeared on the 19th of October in the New York Times in a brief analysis by Mr. Harry Schwartz of the claims made by Khrushchev during his recent 7-hour marathon before the [Communist] Congress.

Mr. SOURWINE. Can you identify this article by the headline?

Mr. GWYER. Yes. The headline is "U.S. Lead Substantiated by Harry Schwartz."

This appears on page 14 of the New York Times dated October 19, 1961, and he said:

> There are many important production areas in which the Russians have narrowed the gap with the United States substantially, and some where Soviet output is actually ahead. The brightest comparison for the Soviet Union is in machine tools. Last year's Soviet production of 154,000 machine tools was not only more than three times that of the United States, but also 60 percent better than the United States' production in 1952.

Senator KEATING. Let me put it the other way.

Mr. GWYER. Yes.

Senator KEATING. If you took the heavy machine tools on both sides, you say that the figures would have been about even rather than 4 to 1.

Mr. GWYER. Completely disregarding the productivity of machine tools, though most of the technical experts, machine tool experts, agree that the American machine tools are much more productive than the Soviet; if we take the numbers alone as a criterion, I would say that this is relatively even.

Senator KEATING. Now, if you took the production of all machine tools in the United States rather than just the heavy machinery, how would that compare with the 135,000 figure for Russia?

Mr. GWYER. The United States in the year in question, as referred to by Mr. Dulles, produced approximately the same number of machine tools as the Soviets did.

Senator KEATING. Both in heavy and in total?

Mr. GWYER. And in light; correct. As a matter of fact, the American statistics, as compiled by "Facts for Industry," Bureau of Census, Department of Commerce, gave the figures for the United States as roughly 118,000 to 130,000 or 135,000 for the Soviet Union.

Senator KEATING. I see.

Mr. GWYER. This year—not this year, last year—1960, according to these figures, we have produced just as many or perhaps more than the Soviets did, and our classification excludes the garden type, hobby shop, garage variety machine tools, and items like, say, a drill press, which is used for personal purposes in someone's basement. Actually we don't consider that as a machine tool.

Senator KEATING. Do we have any technical advantage in our production of machine tools?

Mr. GWYER. Yes; we definitely do. There is no question about the technological supremacy built into American machine tools, and the Soviet requests for machine tools. American machine tools have been known over the years, and some of the machine tools which we produce here in this country cannot even be duplicated abroad.

I think the hearings by Senator Dodd in the early part of this year have proved very well this point.

Senator KEATING. Proceed, counsel.

Mr. SOURWINE. Mr. Gwyer, may I ask that that publication be returned and the order be that it be held in the committee's files as part of this record for reference.

Senator KEATING. And to be subject to this analysis by Mr. Gwyer.

Mr. SOURWINE. Yes.

Do you need this for the analysis, is it the only copy?

Mr. GWYER. This is the only one copy.

Mr. SOURWINE. Let it be retained, with the Chairman's permission.

Mr. Gwyer, I show you the following correspondence, a letter to you under date of December 15 by Nate White, business and financial editor of the Christian Science Monitor; another letter to you from the same individual dated December 28, 1960; a copy of your letter of January 27, 1961, to Mr. White; his letter to you of February 3, 1961; a tearsheet from the Christian Science Monitor of Tuesday, January 31, 1961; your letter to Mr. White under date of January 6, 1961; your letter to Mr. White under date of December 20, 1960. I apologize to the Chair for not having those in chronological order as they should have been.

All this material was furnished the committee from your files; is that correct?

Mr. GWYER. Yes, sir; these are.

Mr. SOURWINE. Will you tell us briefly what the significance of this correspondence is, why you thought it would be of interest to this committee?

Mr. GWYER. Yes. Last year I was approached by Mr. White and he asked me for a brief interview. He was trying to get the benefit of my thinking on the Soviet machine tool situation.

Senator KEATING. Who is Mr. White?

Mr. GWYER. Mr. Nate White, editor of Christian Science Monitor, business and financial editor.

He went to the Soviet Union last year and he made a comment to me when he said that, "I thought that Portugal was a poor country," referring to the wealth of the Soviet Union, and since his trip to the Soviet Union as a tourist left a certain imprint on his mind about the Soviet position that the Soviet Union occupies as an industrial power, he decided to write a series of articles in the Christian Science Monitor portraying the various aspects of Soviet development over the number of years.

He asked my advice about material he should include in his article dealing with machine tools.

I gave him practically all the material I had on hand. He had a copy of my article I published in Ordnance magazine dealing with the Soviet machine tools, and starting from there he wrote an article.

He was kind enough to send the draft of his article for my review, my criticism, my opinion. I think specifically he asked me to write down comments.

After reading his article I replied that since the information in the paper which I just wrote is fully documented, and this information based on Soviet sources it would be, say, beneficial to the readers of the Christian Science Monitor to have a comparison of views of the American visitors to the Soviet Union visiting machine tool plants with the views of what the Soviets themselves think about their own industry.

I sent my material, together with the manuscript, to Mr. White, and shortly afterward I received a reply in which he said that he gives preference to the people that visited the Soviet Union, to their impressions, their observations; consequently, he will not be in a position to use the material I provided him with, although he left a reference in his paper to my views saying, in brief, that Mr. Joseph A. Gwyer, Washington, D.C., does not agree with the views expressed by the visitors, which he summarized in the form of an article.

In reply to his letter, I wrote a brief letter to him asking politely to strike any references to my name since I believed that the use of my name, together with the usage of the names of visitors to the Soviet Union, would lend only some sort of credence to his position. I disagreed with the contents of his article.

Consequently, the fact that he would say that Gwyer "disagrees with my article," would not serve any purpose and I asked him to delete my name or any references to my name, my writings, from the records.

The article was published. Here is a copy of it, and it contains very vague data which we hear repeated over and over again.

Senator KEATING. Do you reach the conclusion that the writers of the article—I think we must assume they are sincere and genuine—were misled by what they saw or were only shown certain things?

Mr. GWYER. This is beside the point, but actually this is a summary of views of various people who went to the Soviet Union. These views are not necessarily of people who are familiar with machine tools or machine tool production. Consequently, they are only observations or cursory statements.

Senator KEATING. Are any of them machine tool people?

Mr. GWYER. Not machine tool people as such, that is, machine tool engineers. Quite a few of them are familiar with machine tools, being people who are involved in production of various types of equipment in the United States.

Senator KEATING. I think we neglected—we did take it in executive session—I think we neglected to qualify you as a witness.

Mr. Gwyer, you tell us, will you, about your education.

Mr. GWYER. I am—I will reply in the negative—I am not a machine tool expert. I have engineering training, but I received a bachelor's degree in business administration, and a master's degree in industrial economics. I am not a machine tool engineer.

Senator KEATING. I am not talking about that. I am trying to find out what you are, not what you are not.

Would you tell us where you went to college, what degrees you got, and what your experience has been.

Mr. GWYER. I went to Warsaw Polytechnical Institute in Poland.

Senator KEATING. That is where you received your AB degree?

Mr. GWYER. No. That is where I was studying engineering. Then after a brief service in the U.S. Armed Forces, 1942–46, I went to school under the GI bill here in Washington, D.C., and I received my bachelor's degree in business administration at American University, and I also received my master's degree in industrial economics here in Washington, D.C.

Senator KEATING. Then immediately you went to the Library of Congress?

Mr. GWYER. Yes. I did some post-master's degree work, toward my doctorate, but I haven't finished this work, and I am currently with the Library of Congress.

Senator KEATING. How long were you with the Library of Congress?

Mr. GWYER. I started with the Library of Congress in 1950, and I was with the Library until 1954. I spent a short time with a local corporation here in Washington, D.C., called Council for Economic & Industry Research, and then in 1955 I went to the Pentagon and I

was with the Department of the Army as a military intelligence research specialist.

I returned to the Library in 1958 where I occupy a position as senior research specialist in industrial engineering with the specialty of equipment analysis in terms of the productivity of equipment, availability of equipment, obsolescence of industrial equipment in the Soviet Union; quality control and related items.

Mr. SOURWINE. You have then spent a number of years in detailed study of Soviet economic situations and Soviet production of various kinds?

Mr. GWYER. Yes; I have.

Senator KEATING. You read or write the Russian language?

Mr. GWYER. Yes; I do read.

Mr. SOURWINE. Can you read Russian trade publications and trade journals?

Mr. GWYER. Yes; I do in the process of my work; I go through a number, a large number, of Soviet trade journals and publications.

Mr. SOURWINE. You keep yourself or try to keep yourself current with regard to activity of this nature in the Soviet Union as reported on currently in the Soviet journals?

Mr. GWYER. That is correct.

Mr. SOURWINE. Mr. Chairman, may I ask that the correspondence that the witness has just testified to with respect to Mr. White go into the record at this point?

Senator KEATING. It may be received.

(The documents referred to were marked "Exhibit No. 4" through "Exhibit No. 4–G" and read as follows:)

EXHIBIT No. 4

OCTOBER 17, 1960.

Mr. JOSEPH A. GWYER,
Library of Congress, Washington, D.C.

DEAR MR. GWYER: It was good of you to give me the time last week. I would appreciate receiving any information you may assemble on the subject and having a copy of your Princeton talk. I have run into some conflicting information and I am trying to digest it and understand it.

All the best.

Sincerely,

NATE WHITE,
Business and Financial Editor.

EXHIBIT No. 4–A

THE CHRISTIAN SCIENCE MONITOR,
Boston, Mass., December 15, 1960.

Mr. JOSEPH A. GWYER,
Library of Congress, Washington, D.C.

DEAR MR. GWYER: Here is the article on machine tools for my industrial series on the U.S.S.R. which begins in our paper December 28. This article is currently scheduled for January 31.

I have had trouble getting truly first-rate, first-hand reports on the machine-tool industry in the U.S.S.R. today, and have been deeply appreciative of your help and comments. If you see holes in the article or if there is additional information you think it should include, I would appreciate it if you would let me know.

Cordially,

NATE WHITE,
Business and Financial Editor.

EXHIBIT No. 4–B

WASHINGTON, D.C., *December 20, 1960.*

Mr. NATE WHITE,
Business and Financial Editor,
The Christian Science Monitor, Boston, Mass.

DEAR MR. WHITE: In reference to your letter of December 15, 1960, in which you are asking for my comments and suggestions on your article re: Soviet machine tools, I am enclosing a copy of a recently completed study titled "Soviet Metal-Cutting Machine Tools: Assertions and Facts." This article fully expresses my views and opinions on the subject.

I hope you find it interesting and informative and perhaps adequate enough for inclusion in the Christian Science Monitor series on "The U.S.S.R.: Economic Giant?"

Should this be the case, I will be more than happy to rush the original (bond) to you together with a copy of my Princeton talk and a brief biographical sketch of myself.

In all fairness I would like to inform you that this enclosed contribution on Soviet machine tools has already stirred a stormy controversy and a public "thrashing out" of this subject will be of a great service to all of us. Should I be proven wrong, I will not hesitate to go with the opinion of those who rationally and logically can point out gaps or shortcomings in my approach to the whole problem.

Hope to hear from you soon.

Sincerely yours,

JOSEPH A. GWYER.

EXHIBIT No. 4–C

THE CHRISTIAN SCIENCE MONITOR,
Boston, Mass., December 28, 1960.

Mr. JOSEPH A. GWYER,
Library of Congress, Washington, D.C.

DEAR MR. GWYER: For the period over which my series of articles on the Soviet Union will be published I am going to send you the Christian Science Monitor every day. It was easier for our list department to handle this special mailing this way (for the next 3 months) than to try to make spot mailings of the issues containing the articles.

Normally the U.S.S.R. articles will be on Tuesdays and Thursdays with the following exceptions (today, December 28), Wednesday, January 11, and Wednesday, March 8.

Again I wish to thank you for your help in producing this series.

Sincerely,

NATE WHITE,
Business and Financial Editor.

EXHIBIT No. 4–D

WASHINGTON, D.C., *January 6, 1961.*

Mr. NATE WHITE,
Business and Financial Editor,
The Christian Science Monitor, Boston, Mass.

DEAR MR. WHITE: Enclosed are the original (bond) copy of my study "Soviet Metal-Cutting Tools: Assertions and Facts," draft of my Princeton talk, and tearsheets from Machinery containing my "Appraisal of Soviet Mechanization and Automation." I am also returning copy No. 9 of your article "The U.S.S.R.: Economic Giant?" No. 10.

Since my article on Soviet machine tools is of a purely academic character, I doubt if you can use it in its original form. It has to be rewritten to conform to the journalistic style of the Monitor. What I have in mind, and the decision will be up to you, is a rewrite that would incorporate the views of American observers contained in your article with Soviet statements and data contained

in mine. Such an approach, in my opinion, will give the reader a better chance to compare and evaluate the various estimates of Soviet machine tool progress. I hope that we may discuss this subject further.

Cordially,

JOSEPH A. GWYER.

EXHIBIT No. 4–E

JANUARY 24, 1961.

Mr. JOSEPH A. GWYER,
Washington, D.C.

DEAR MR. GWYER: I have considered this thoroughly, but what I have come up against is a flood of competent material from people who have actually visited the Soviet machine-tool factories and seen their machines in operation. These are presidents or engineers of some of our finest organizations, and they have extended through the steel, electrical, plastics, petroleum, automobile, and even into the machine-tool organizations. So I have decided to accept the firsthand material against the very weighty evidence which you have provided from your Soviet literature research. What we have been after are the people who have actually been there and seen the machine tools in operation. And I think I have finally achieved that.

I appreciated having a visit with your mother, and I enjoyed seeing you in Washington.

With all good wishes.

Sincerely,

NATE WHITE,
Business and Financial Editor.

EXHIBIT No. 4–F

WASHINGTON, D.C., *January 27, 1961.*

Mr. NATE WHITE,
Business and Financial Editor,
The Christian Science Monitor, Boston, Mass.

DEAR MR. WHITE: Thank you for the return of my manuscripts. You will recall, that during our conversation on October 11, 1960, here in Washington, on the subject of Soviet industrial development, you said that the Christian Science Monitor would not publish anything about me or my writings without my consent.

Since I disagree with most views and opinions based on conducted tours of the Soviet industries rather than on broad and serious research, I cannot permit my name to be used in a way that would imply either concurrence with or opposition to the gist of your findings. I therefore kindly request that my name or any reference to my writings be deleted from the series "The U.S.S.R.: Economic Giant?" No. 10, containing data on Soviet machine tools and any subsequent issues.

I appreciate very much your interest in my writings.

Sincerely,

JOSEPH A. GWYER.

EXHIBIT No. 4–G

THE CHRISTIAN SCIENCE MONITOR,
Boston, Mass., February 3, 1961.

Mr. JOSEPH A. GWYER,
Washington, D.C.

DEAR MR. GWYER: I have deleted all reference to you in the article. I had reduced the section about you to one in which I said that you were in basic disagreement on the whole question. However, at your request I have removed this.

With all best wishes,

Sincerely,

NATE WHITE, *Business and Financial Editor.*

Mr. SOURWINE. Mr. Gwyer, have you given consideration to the controversy as to whether there should or should not be an embargo on shipments to the Soviet Union, specifically with respect to an embargo on machine tools to the Soviet Union?

Mr. GWYER. Yes; I gave considerable thought to this problem, and in the process of my research over the last 3 or 4 years, I was either directly or indirectly involved in trying to assess the Soviet capability of manufacturing certain types of machine tools and also trying to determine the areas where the Soviet industry is deficient in certain types of machine tools.

Mr. SOURWINE. On the basis of your studies and your expert knowledge in this area, do you have a firm conviction one way or the other as to whether there should be an embargo on machine tool shipments to the Soviet Union?

Mr. GWYER. I never was a spokesman for the Government because I never entered any direct negotiations regarding an embargo.

From my personal standpoint, on the basis of the data I have studied over a number of years, I think that every single machine tool is strategic and should be withheld from the Soviet bloc.

Mr. SOURWINE. You are aware, are you not, that various members of the committee have expressed the opinion that there should be an embargo on machine tool shipments to the Soviet Union?

Mr. GWYER. Yes, I am aware. I am aware of the statement made by Senator Dodd, the vice chairman of this subcommittee, a statement made on August 18, 1961.

Mr. SOURWINE. I believe that the presiding Senator here today has also made statements along this same line.

Are you aware also of the position taken, officially, by the Government of the United States in this regard?

Mr. GWYER. Well, I am aware of what has been released for publication by the Department of Commerce.

I am familiar with the statements released to the press by Secretary of Commerce Hodges, and Secretary of State, Mr. Rusk.

Mr. SOURWINE. What is your Government's official position in this regard, as you understand it?

Mr. GWYER. Well, the problem of restrictions on strategic materials going to the Soviet Union appears to fluctuate with the international tensions.

Since the tensions in Berlin are so great it appears that the various agencies here in Washington, D.C., concerned with export control are trying to tighten up the restrictions on the shipment of strategic items to the Soviet Union.

Senator KEATING. It is pretty late to tighten up when a crisis arises, is it not?

Mr. GWYER. Well, this reminds me of an item which was taken up by the Senate Internal Security Subcommittee. During, I think, February, the statement was made, I think either by Senator Dodd or by one of the other members of the subcommittee, that while taking up the Bryant case of grinders they did not object to the shipment of grinders by Jones & Lamson.

Now, these grinders left the United States, and this is official information. I think some were shipped in April, some were shipped in May of this year. These are complex grinders; perhaps they are not

as precise as the grinders manufactured by Bryant, but just the same they are strategic equipment.

I think personally that Jones & Lamson shouldn't have been allowed to ship these grinders to the Soviet Union.

Mr. SOURWINE. Should not have been?

Mr. GWYER. I beg your pardon, sir?

Mr. SOURWINE. You say "should not have been"?

Mr. GWYER. They should not have sent these items to the Soviet Union.

Mr. SOURWINE. In other words, you are saying that while the committee may have done some good in whatever sense it had responsibility for stopping the shipment of the precision grinders on the miniaturized ball-bearing races that were made by Bryant, that the committee didn't go far enough, and it should have made an effort to stop the Jones & Lamson shipments also?

Mr. GWYER. It is true—you have to view the approach used by the subcommittee in perspective. Actually the Bryant grinders were basically grinders intended for use by the military, and the strategic value of these grinders was greater than the strategic value of the Jones & Lamson grinders.

If you take the qualifications used by the administrator of the Battle Act list, you have grinders, these manufactured by Bryant being strategic items, and the grinders manufactured by Jones & Lamson, as strategic of lesser importance.

Consequently, I think the committee, the subcommittee—I am sorry—emphasized the strategic value of the Bryant grinders.

Mr. SOURWINE. You don't have to go easy on the committee. The fact remains your testimony is that the Jones & Lamson grinders should have been stopped, too; is that correct?

Mr. GWYER. Yes; I think they should have been stopped.

Mr. SOURWINE. This is in line with what I take to be your expressed view that any machine tool shipments to the Soviet Union from the United States are a mistake.

Mr. GWYER. I hate to bring into a picture people who are not directly involved in this inquiry, but a very good friend of mine from the Department of Defense said that "I would rather send them a gun than a machine tool because a gun can be used X times and the gun is done, it is finished. A machine tool can be used over and over again to manufacture these guns. It is almost unlimited."

Senator KEATING. I am afraid maybe he was a little too low ranking to have his views carry enough weight.

Mr. GWYER. Well, I think he is influential, but very simply he may be overruled. I think he testified before this subcommittee.

Senator KEATING. Let me ask you this—we encountered it when we had the inquiry into these grinders—the story was put to us that these machines are available in European countries, so if we don't ship them from here the European countries will ship them.

Would you give us your views on that argument?

Mr. GWYER. I would pose an answer to your question, your inquiry, by posing a question. Why are the Western European nations allowed to send similar equipment? You see, there is an interrelationship between the two. This brings us to——

Senator KEATING. There is no question that they have a different list and they do not have as strict control over what they ship as we do.

Mr. GWYER. Well, we have a much stricter list. I presume, as a member of this committee, you have access to the Battle Act list which is classified. That list contains in general terms more items than the international list maintained by CoCom, and each country, individual country, has a modification, as a matter of fact, of a CoCom list.

I am aware of the British modifications of the CoCom list, although there is a close agreement between the two, although the British are much more lax in trying to stick to the particular line as indicated by the CoCom agreement.

Mr. SOURWINE. Mr. Gwyer, something you said a moment ago might have left the impression that you accepted the statement that there were available in Western Europe machine tools, specifically grinders, comparable to the Bryant grinders on which shipment was stopped. Is this true or do you have knowledge to the contrary?

Mr. GWYER. No, I have knowledge to the contrary and, actually, if we review the testimony and the documents presented to the subcommittee, Senate Internal Security Subcommittee, we find that the position of the Commerce Department as justifying issuance of license that these machines are available in Europe, Western Europe, and I say equally productive machines, similar machines, capable of performing identical functions or similar functions, proved to be wrong.

Mr. SOURWINE. In other words, you agree with the conclusion the committee reached on this point?

Mr. GWYER. Yes, I do; and I would question statements that similar equipment is available in Western Europe, consequently there is no sense in denying this equipment from being licensed to the Soviet Union.

Mr. SOURWINE. This is a statement which we reach or hear many times in justification of one kind of shipment or another, is it not?

Mr. GWYER. That is correct.

Mr. SOURWINE. And you are saying you think it very often is not true?

Mr. GWYER. I think very often it is not true.

Mr. SOURWINE. Do you know where the Commerce Department got its, what you call misinformation, about the availability of the grinding machines in Western Europe?

Mr. GWYER. I couldn't comment in open session. I would be glad to answer this question——

Mr. SOURWINE. You say you do know?

Mr. GWYER (continuing). In executive hearing because——

Mr. SOURWINE. Are you saying you do know but you can't give us an answer in open session because it is classified information?

Mr. GWYER. That is correct, sir.

Senator KEATING. Your views will be respected, and we will ask for that in executive session.

Mr. GWYER. That is right, sir.

Senator KEATING. Although I think we have that evidence in our records as a result of our investigation before.

Let me ask you this: Do you believe that it is possible to separate Poland and Yugoslavia from the overall economic setup of the Soviet Union and Eastern Europe?

Mr. GWYER. Of course, my views are my personal views, based, perhaps, on——

Senator KEATING. I realize that.

Mr. GWYER. Based, perhaps, on knowledge of the situation in central Europe, knowledge of the situation in Poland, the political alinement in Poland and Yugoslavia.

Personally, I think it is a mistake to extend aid both to Poland and Yugoslavia.

Senator KEATING. In other words, if we are going to deny machine tool shipments to the Soviet Union, we should deny them to Poland and Yugoslavia?

Mr. GWYER. That is correct, Mr. Chairman.

Can I bring, Mr. Chairman——

Senator KEATING. Yes.

Mr. GWYER. This is an item here, which perhaps the subcommittee would like to enter on the record. During the Bryant hearings conducted earlier this year, the vice president of Bryant Co. stated that Bryant was allowed to send some grinders to Poland "a year or so ago."

If we look at the transcript of the testimony given before the Senate Internal Security Subcommittee we will find that these grinders are almost exclusively of military value, of military usage, to produce military hardware, military equipment.

Now, the question may arise in your mind, perhaps, as to why these grinders were allowed to go to Poland. This is—I am putting this in the form of a question.

Senator KEATING. I judge it has arisen in your mind.

Mr. GWYER. I think it was a mistake because I presume these grinders wound up in the Soviet Union, and since the Soviet Union could not duplicate, could not copy, these grinders, they decided to purchase 45 of these grinders from the United States. This is my line of reasoning.

Senator KEATING. In other words, you feel that there is a very great danger, if strategic goods are shipped to Poland or Yugoslavia, they will wind up benefiting the economy of the Soviet Union?

Mr. GWYER. I believe that this is a distinct possibility, although I don't know to what extent the various Government agencies responsible for licensing do enforce the rule that an item shipped to Poland is to be used exclusively by the Poles.

Senator KEATING. These grinders that we are talking about were designed for missile ball-bearing manufacture, weren't they?

Mr. GWYER. That is correct, sir.

Mr. SOURWINE. Mr. Gwyer, I show you a photocopy of a column that appeared in Metalworking News, Monday, August 21, 1961, headed "Washington Wire, U.S. Foreign Economy Gearing to 'Three Worlds'."

Have you seen this article before?

Mr. GWYER. Yes, I have.

Mr. SOURWINE. Do you have a comment with respect to it?

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Mr. GWYER. Yes, because this deals closely with the suggestion advanced by Senator Dodd on the Senate floor on August 18 in which Senator Dodd asked specifically that the United States, in concert with our Western allies, declare an embargo on machine tools and chemical processing equipment going to the Soviet bloc nations.

This article here refers to both Secretary of Commerce Hodges and Secretary of State Dean Rusk reviewing economic sanctions that the United States might take against the Soviet Union.

A few days ago, and I quote here this Washington wire, "they concluded no action along this line was needed now," and I emphasize "now."

Senator KEATING. What is the date of this?

Mr. GWYER. This is August 21, 1961, Metalworking News—"but they took pains to make sure the Russians knew the matter was being studied."

Actually, taking an action such as an embargo, economic sanctions against the Soviet Union, I think is a matter of national urgency, and I don't think it should be discussed publicly, in a sense. This should be an executive session. We either take sanctions or we don't take sanctions.

Revealing this information that these are being studied may serve, I think, dubious purposes because the Soviets, reading this type of a release, will say, "they are just still bickering about whether they should apply sanctions against us or not. Let us keep on trading."

Mr. SOURWINE. May this article be received, Mr. Chairman?

Senator KEATING. It may be received.

(The document referred to was marked "Exhibit No. 5" and reads as follows:)

EXHIBIT NO. 5

[From the Metalworking News, Aug. 21, 1961, p. 22]

WASHINGTON WIRE—U.S. FOREIGN ECONOMY GEARING TO "THREE WORLDS"

(By the staff of the Washington Bureau)

WASHINGTON.—U.S. foreign economic policies are getting about as complicated as those three-level superhighway systems around big cities.

According to one high-ranking Government official in the foreign economic policy field, the old, simple concepts of "protectionism" and "free trade" are as out of date as the model T.

At any rate, the Government's foreign economic policies now are being geared to "three worlds." These are:

1. The new-developing areas, who want market stability for commodity prices while they also seek to enter the ranks of industrialized nations producing manufactured products for sale abroad for dollars, or other hard currencies.

2. The older, industrialized "trading partners" of the United States including those who are working through the Common Market in Europe to create a dynamic, fast-growing economic bloc. It's now accepted here as a sure thing that Britain, Norway, Denmark, and other countries will join the Common Market after suitable negotiations. Still uncertain is how Sweden, Switzerland, Austria, Spain, and Portugal will ultimately fit into the giant West Europe trading bloc.

3. The Communist bloc challenge. Here the prospects are said to be that more export surpluses will be dumped into world markets by the Soviet Union and its trading partners, as time goes by, and that this will be done to disrupt markets and cause economic troubles for free world nations.

BERLIN PROBLEM

If the Berlin situation keeps on getting worse, don't be surprised if West Germany, the United States, Britain, France, and other countries start applying economic pressures on East Germany.

West German Chancellor Konrad Adenauer has threatened the East German regime that Bonn may cut off all trade—and East Germany is getting a large volume of industrial equipment and other goods from West Germany now.

The East Germans have replied that they would counter this with another Berlin blockade.

Outside of Germany, the North Atlantic Treaty Organization headquarters near Paris currently is working on broader "economic countermeasures" that the NATO allies would agree to apply, not only against East Germany but the Soviet Union if Moscow keeps prodding the world to the brink of world war III over the Berlin issue.

If an economic blockade is put on East Germany later this year, it won't be done by West Germany acting alone. It'll be done by the entire NATO bloc, acting in unison.

Commerce Secretary Luther Hodges and Secretary of State Dean Rusk also have been reviewing what economic sanctions the United States might apply against the U.S.S.R.

A few days ago, they concluded no action along this line was needed now, but they took pains to make sure the Russians knew the matter was being studied.

ECONOMIC BOOM

The business outlook for the remainder of 1961 and the first half of 1962 is being tagged by some economic forecasters as the makings of another economic boom.

That kind of talk hasn't been heard much since late 1959, when almost everyone got over enthused about the "sizzling sixties."

It does appear to be a safe bet that key Government economic indicators will reflect month-to-month gains during the rest of this year.

In July, for example, the Federal Reserve Board's industrial production index hit a new high of 112. The previous peak was 111, in January 1960, when business was accumulating inventories of durable goods at a rapid pace.

So far in the current business recovery cycle, inventory accumulation has been more gradual.

The business community seemingly views the defense spending buildup about the same way AFL-CIO President George Meany sized it up the other day after a White House conference.

He said bigger defense spending would mean more jobs and less unemployment—but the real impact of this probably would not come until early next year.

The Federal Reserve Board noted, incidentally, that prices of basic commodities "generally have shown little change since July 25 when an increase in defense spending was announced."

Mr. SOURWINE. You mentioned CoCom; so that the record may be quite clear, what is CoCom?

Mr. GWYER. CoCom is a committee which functions specifically to unite or synthesize the views of most of the NATO countries in Europe, then the United States and Canada and, to some extent, Japan.

It is called a coordinating committee. It is part of a consultative group which we use as a way, one way, of trying to enforce an embargo on items which we in unison or in CoCom agree shouldn't be shipped to the Soviet Union.

Mr. SOURWINE. It is a vehicle for international cooperation between this Nation and our allies and friends in Western Europe for the purpose of preventing the shipment of strategic goods to the Soviet bloc; is that a fair statement?

Mr. GWYER. Yes, I think so; it is a fair statement.

Mr. SOURWINE. To what extent do you consider that this has been successful or, to put it another way, do you know of any outstanding instances of strategic shipments from Western Europe to the Soviet bloc despite the work of CoCom?

Mr. GWYER. Yes.

Mr. SOURWINE. Would you tell us about some of these?

Mr. GWYER. Yes. Despite the CoCom arrangements, Great Britain, France, Italy, and West Germany are expanding their trade with the Soviet bloc nations, and items which enter the trade between East and West are definitely of a strategic nature.

Mr. SOURWINE. Now, France, within the last 2 months, shipped a 30-ton tube-drawing frame to the Soviet Union, did it not?

Mr. GWYER. Yes; they have.

Mr. SOURWINE. Manufactured specifically for the Soviet Union.

Mr. GWYER. Yes.

Mr. SOURWINE. This was a tube-drawing frame with a daily capacity of as much as 92,000 feet of tube.

Mr. GWYER. Yes.

Mr. SOURWINE. Would this have been possible of shipment under our own restricted list?

Mr. GWYER. Well, you see I have to qualify my answer. The CoCom list is a classified list, secret. I don't know what items enter into the CoCom list. I am aware that this 30-ton press or tube-drawing machine is on a positive list.

Mr. SOURWINE. In other words, we couldn't have shipped it from this country.

Mr. GWYER. Definitely we couldn't.

Mr. SOURWINE. You can't say whether its shipment was a violation of the CoCom list?

Mr. GWYER. That is correct.

Mr. SOURWINE. But we would have considered it strategic, we do consider it strategic, and it couldn't have been shipped from this country?

Mr. GWYER. Correct.

Mr. SOURWINE. Do you also consider it to be a matter of strategic importance?

Mr. GWYER. I definitely do.

Mr. SOURWINE. You say it should not have been shipped to the Soviet Union from any Western nation?

Mr. GWYER. That is correct.

Mr. SOURWINE. The United States still maintains a substantial lead over the Soviet Union in automation and the development of automation, does it not?

Mr. GWYER. Yes, we do.

Mr. SOURWINE. When the United States ships even the plans for an automated machine to the Soviet bloc, isn't that a strategic gain for the Soviet Union?

Mr. GWYER. Well, yes, it definitely is, because the erection of a plant or erection of a piece of equipment without the blueprint or drawings would be impossible.

Mr. SOURWINE. Do you know whether it is true that the Soviet Union or other Soviet bloc nations can secure plans and blueprints for

automated machines from the United States even in cases where they can't get the machines themselves?

Mr. GWYER. I would hesitate to answer because I don't know specific cases.

Mr. SOURWINE. You do not?

Mr. GWYER. I know, for instance, that in the case of Bryant grinders, specifications and drawings for these grinders were sent to the Soviet Union before the actual contemplated shipment of grinders. But this was shipped after the initial issuance of a license. I don't think it would be possible if the license was withheld as of the date of the shipment of these drawings.

Mr. SOURWINE. Well, the committee has received information that it is possible for the Soviet Union to make inquiry respecting a machine or an automated process ostensibly for the purpose of determining whether they want to buy it, and that the American manufacturer or producer is, in some instances, permitted to furnish that information even while the administration is still considering whether it will grant a license for the shipment of the machine itself.

You have no information with respect to that?

Mr. GWYER. No information with respect to that. I can merely comment that there is a great gap between a drawing and a finished product. It is quite possible that the Soviets might be seeking out the technical data since they know that a finished item, or piece of equipment, cannot be sent either by the United States or any of the CoCom countries.

Consequently, they would try then to cash in on the technical know-how in the specifications or drawings—call it basic technical data—but I could not cite a specific case.

Mr. SOURWINE. I show you a translation from the Russian, and I will ask you if you can identify it and tell us what it is and what its significance is.

Mr. GWYER. This is a summary of papers and reports prepared for the plenary session of the Technical and Economic Council of the State Committee on Automation in Machine Manufacturing in the Soviet Union.

This plenary session was held in February of this year, and the main emphasis of this plenary session was devoted or was oriented toward problems associated with increased reliability and service life of machines and instruments.

This is significant because the various participants in the discussions during this plenary session emphasized the fact that Soviet equipment is substandard in terms of quality; that machine tools are not as efficient as the Soviets would like to have them; that the raw materials going into production of many industrial items are of questionable quality, and that the Soviet industry, as a whole, is suffering from chronic deficiencies which, if not corrected, will definitely retard the growth and development of Soviet industry.

Mr. SOURWINE. Do you know who translated this article?

Mr. GWYER. Yes; I know because I did some editing on it myself.

Mr. SOURWINE. You can say that it is an accurate translation?

Mr. GWYER. Yes; it is an accurate translation.

Mr. SOURWINE. This is an article from a Soviet publication?

Mr. GWYER. Yes.

Mr. SOURWINE. At a session in which their own experts were considering their own capacity?

Mr. GWYER. Yes.

Mr. SOURWINE. And it points up the deficiencies in their capacity?

Mr. GWYER. Let me just cite a few names and titles associated with it.

Mr. SOURWINE. Is that correct?

Mr. GWYER. Yes; it is correct.

Mr. SOURWINE. May I ask that this go into the record?

Senator KEATING. Yes; it will be received, and you may cite an instance which you have in mind.

(The translation above referred to was marked "Exhibit No. 6" and is printed as app. II at p. 68.)

Mr. GWYER. You have a statement by Goremykin, Deputy Chairman of the Technical-Economic Council; a statement by Nezhdanov of the All-Union Scientific Research Institute of Electromechanics; a statement by Kuznetsov, chief designer of electrical machinery at the Kharkovskiy electromechanical plant, one of the largest in the Soviet Union.

You have a statement by Sprishevskiy, director of All-Union Scientific Research Institute of the Bearing Industry; a statement by Reshetov, who is the head of the famous Experimental Scientific Research Institute of Metal Cutting Machine Tools; and so on.

These are, more or less in a nutshell, the personalities participating, and this is a very vital problem of reliability of equipment in the Soviet Union.

Mr. SOURWINE. From what you know of the subject yourself and of the persons who are quoted and of the source of the article, are you in a position to form a judgment as to whether this article accurately reflects conditions?

Mr. GWYER. This article definitely portrays the problems the Soviets face, and also I will say by inferential analysis that they are the areas in which the Soviets would like to have some help from the West.

Mr. SOURWINE. It shows why they come to us for a lot of stuff, doesn't it?

Mr. GWYER. That is definite.

Senator KEATING. What is the date of this meeting?

Mr. GWYER. This publication is dated May 1961. The meeting was held in February of 1961, sir.

Mr. SOURWINE. I show you a typed draft of an article headed "Soviet Metal-Cutting Machine Tools: Assertions and Facts," under your own byline. I will ask you if this is an article that you prepared?

Mr. GWYER. Yes. This is an article which I prepared and which figures quite largely in some of the discussions we have on machine tools here in Washington, D.C.

Mr. SOURWINE. This article was prepared for official use, was it?

Mr. GWYER. No; it was not. It was prepared on my own time, my own resources, on Saturdays and Sundays. But I made this article available to anybody interested in the problem of Soviet machine tools.

Mr. SOURWINE. Meaning you made it available to the Government?

Mr. GWYER. Yes. I think it was available to the Department of Defense. The Department of Commerce has a copy of it, I think, and the Department of State.

Mr. SOURWINE. Has this article been published?

Mr. GWYER. No; this article has not been published and again I had problems in publishing this article.

Mr. SOURWINE. May this article be inserted in the record, Mr. Chairman?

Senator KEATING. Yes.

(The article on "Soviet Metal-Cutting Machine Tools; Assertions and Facts," above referred to was marked "Exhibit No. 7" and is printed as app. II at p. 73.)

Mr. SOURWINE. Do you want to summarize your conclusions from this article?

Mr. GWYER. Yes. If the chairman will bear with me, there is a page and half of basic conclusions.

American machine tool engineers are particularly interested in the growth and development in the Soviet metal-cutting, machine tool industry. The latter, if judged by statistics alone, manufactures large quantities of metal-cutting machine tools.

Some of the reports on this subject assert that the Soviet machine tool industry has assumed a quantitative lead over the machine tool industries of the United States and other free world countries; that Soviet machine tools are relatively modern, and that some units are produced three to four times more efficiently. A survey of unclassified Soviet technical literature does not support the above assertions.

Quite to the contrary, it shows that the Soviet industry specializing in the production of metal-cutting machine tools lags behind the United States in terms of output of physical units and is, at least, 15 to 20 years behind the United States in machine tool technology.

The past and current Soviet emphasis on quantity rather than quality of machine tools exerts a detrimental effect on the production of modern equipment.

Plant managers and employees alike are reluctant to retool for new models. This is especially true when it means a protracted down time, foregoing lucrative premiums for reaching and surpassing assigned quotas with obsolete World War II models.

In 1956, from 90 to 96 percent of the Soviet industrial-type, metal-cutting machine tools—and when I say industrial type I say these are the heavier ones—90 to 96 percent of Soviet industrial-type, metal-cutting machine tools programed for production in lots greater than 10 units by the 48 plants of the former Ministry for Machine Tool and Tool Industry were of World War II design.

Although the Soviets have made some progress since 1956, their situation as of this moment is unsatisfactory. This may explain the Soviet drive to dump on the markets of underdeveloped countries of the world at a constantly increasing scale the relatively inefficient and obsolete machine tools manufactured at home and the paradoxical desire, in view of their boasted technological supremacy, to acquire Western Europe's and America's most advanced metal-cutting machine tools.

This can be only because the latter have built into them the technical and engineering knowledge the Soviets are not in a position to duplicate.

I think this more or less brings into focus the basic findings of the study.

Mr. SOURWINE. That is very important in view of the quotation that has previously been referred to, making a comparison between American machine tool production and Soviet machine tool production, simply on the number of units; isn't that correct?

Mr. GWYER. That is correct.

Mr. SOURWINE. You are saying the Soviet machine tools are essentially obsolete?

Mr. GWYER. Yes; they are.

Mr. SOURWINE. And they are dumping them on the underdeveloped countries and trying to get for their own use as much as they can of the machine tools which are not obsolete and which are produced in the United States or in Western Europe?

Mr. GWYER. Correct.

Mr. SOURWINE. Do you have further comment regarding that article or does that summary cover it?

Mr. GWYER. No; this covers it fairly well. Actually I don't think—it won't be necessary to go further.

Mr. SOURWINE. Mr. Chairman, I have some questions about the Battle Act, and it might be a good idea to put a copy of the act into the record at this time.

Senator KEATING. That will be received at this time.

(The document referred to was marked "Exhibit No. 8" and reads as follows:)

(EXHIBIT No. 8)

Public Law 213—82d Congress

Chapter 575—1st Session

H.R. 4550

AN ACT To provide for the control by the United States and cooperating foreign nations of exports to any nation or combination of nations threatening the security of the United States, including the Union of Soviet Socialist Republics and all countries under its domination, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Mutual Defense Assistance Control Act of 1951".

TITLE I—WAR MATERIALS

SEC. 101. The Congress of the United States, recognizing that in a world threatened by aggression the United States can best preserve and maintain peace by developing maximum national strength and by utilizing all of its resources in cooperation with other free nations, hereby declares it to be the policy of the United States to apply an embargo on the shipment of arms, ammunition, and implements of war, atomic energy materials, petroleum, transportation materials of strategic value, and items of primary strategic significance used in the production of arms, ammunition, and implements of war to any nation or combination of nations threatening the security of the United States, including the Union of Soviet Socialist Republics and all countries under its domination, in order to (1) increase the national strength of the United States and of the cooperating nations; (2) impede the ability of nations threatening the security of the United States to conduct military operations; and (3) to assist the people of the nations under the domination of foreign aggressors to reestablish their freedom.

It is further declared to be the policy of the United States that no military, economic, or financial assistance shall be supplied to any nation unless it applies an embargo on such shipments to any nation or combination of nations threatening the security of the United States, including the Union of Soviet Socialist Republics and all countries under its domination.

This Act shall be administered in such a way as to bring about the fullest support for any resolution of the General Assembly of the United Nations, supported by the United States, to prevent the shipment of certain commodities to areas under the control of governments engaged in hostilities in defiance of the United Nations.

SEC. 102. Responsibility for giving effect to the purposes of this Act shall be vested in the person occupying the senior position authorized by subsection (e) of section 406 of the Mutual Defense Assistance Act of 1949, as amended, or in any person who may hereafter be charged with principal responsibility for the administration of the provisions of the Mutual Defense Assistance Act of 1949. Such person is hereinafter referred to as the "Administrator".

SEC. 103. (a) The Administrator is hereby authorized and directed to determine within thirty days after enactment of this Act after full and complete consideration of the views of the Departments of State, Defense, and Commerce; the Economic Cooperation Administration; and any other appropriate agencies, and notwithstanding the provisions of any other law, which items are, for the purpose of this Act, arms, ammunition, and implements of war, atomic energy materials, petroleum, transportation materials of strategic value, and those items of primary strategic significance used in the production of arms, ammunition, and implements of war which should be embargoed to effectuate the purposes of this Act: *Provided*, That such determinations shall be continuously adjusted to current conditions on the basis of investigation and consultation, and that all nations receiving United States military, economic, or financial assistance shall be kept informed of such determinations.

(b) All military, economic, or financial assistance to any nation shall, upon the recommendation of the Administrator, be terminated forthwith if such nation after sixty days from the date of a determination under section 103(a) knowingly permits the shipment to any nation or combination of nations threatening the security of the United States, including the Union of Soviet Socialist Republics and all countries under its domination, of any item which he has determined under section 103(a) after a full and complete investigation to be included in any of the following categories: Arms, ammunition, and implements of war, atomic energy materials, petroleum, transportation materials of strategic value, and items of primary strategic significance used in the production of arms, ammunition, and implements of war: *Provided*, That the President after receiving the advice of the Administrator and after taking into account the contribution of such country to the mutual security of the free world, the importance of such assistance to the security of the United States, the strategic importance of imports received from countries of the Soviet bloc, and the adequacy of such country's controls over the export to the Soviet bloc of items of strategic importance, may direct the continuance of such assistance to a country which permits shipments of items other than arms, ammunition, implements of war, and atomic energy materials when unusual circumstances indicate that the cessation of aid would clearly be detrimental to the security of the United States: *Provided further*, That the President shall immediately report any determination made pursuant to the first proviso of this section with reasons therefor to the Appropriations and Armed Services Committees of the Senate and of the House of Representatives, the Committee on Foreign Relations of the Senate, and the Committee on Foreign Affairs of the House of Representatives, and the President shall at least once each quarter review all determinations made previously and shall report his conclusions to the foregoing committees of the House and Senate, which reports shall contain an analysis of the trade with the Soviet bloc of countries for which determinations have been made.

SEC. 104. Whenever military, economic, or financial assistance has been terminated as provided in this Act, such assistance can be resumed only upon determination by the President that adequate measures have been taken by the nation concerned to assure full compliance with the provisions of this Act.

SEC. 105. For the purposes of this Act the term "assistance" does not include activities carried on for the purpose of facilitating the procurement of materials in which the United States is deficient.

TITLE II—OTHER MATERIALS

SEC. 201. The Congress of the United States further declares it to be the policy of the United States to regulate the export of commodities other than those specified in title I of this Act to any nation or combination of nations threatening the security of the United States, including the Union of Soviet Socialist Republics and all countries under its domination, in order to strengthen the United States and other cooperating nations of the free world and to oppose and offset by nonmilitary action acts which threaten the security of the United States and the peace of the world.

SEC. 202. The United States shall negotiate with any country receiving military, economic, or financial assistance arrangements for the recipient country to undertake a program for controlling exports of items not subject to embargo under title I of this Act, but which in the judgment of the Administrator should be controlled to any nation or combination of nations threatening the security, of the United States, including the Union of Soviet Socialist Republics and all countries under its domination.

SEC. 203. All military, economic, and financial assistance shall be terminated when the President determines that the recipient country (1) is not effectively cooperating with the United States pursuant to this title, or (2) is failing to furnish to the United States information sufficient for the President to determine that the recipient country is effectively cooperating with the United States.

TITLE III—GENERAL PROVISIONS

SEC. 301. All other nations (those not receiving United States military, economic, or financial assistance) shall be invited by the President to cooperate jointly in a group or groups or on an individual basis in controlling the export of the commodities referred to in title I and title II of this Act to any nation or combination of nations threatening the security of the United States, including the Union of Soviet Socialist Republics and all countries under its domination.

SEC. 302. The Administrator with regard to all titles of this Act shall—

(a) coordinate those activities of the various United States departments and agencies which are concerned with security controls over exports from other countries;

(b) make a continuing study of the administration of export control measures undertaken by foreign governments in accordance with the provisions of this Act, and shall report to the Congress from time to time but not less than once every six months recommending action where appropriate; and

(c) make available technical advice and assistance on export control procedures to any nation desiring such cooperation.

SEC. 303. The provisions of subsection (a) of section 403, of section 404, and of subsections (c) and (d) of section 406 of the Mutual Defense Assistance Act of 1949 (Public Law 329, Eighty-first Congress), as amended, insofar as they are consistent with this Act, shall be applicable to this Act. Funds made available for the Mutual Defense Assistance Act of 1949, as amended, shall be available for carrying out this Act in such amounts as the President shall direct.

SEC. 304. In every recipient country where local currency is made available for local currency expenses of the United States in connection with assistance furnished by the United States, the local currency administrative and operating expenses incurred in the administration of this Act shall be charged to such local currency funds to the extent available.

SEC. 305. Subsection (d) of section 117 of the Foreign Assistance Act of 1948 (Public Law 472, Eightieth Congress), as amended, and subsection (a) of section 1302 of the Third Supplemental Appropriation Act, 1951 (Public Law 45, Eighty-second Congress), are repealed.

Approved October 26, 1951.

Mr. SOURWINE. Are you familiar with the Battle Act, Mr. Gwyer?

Mr. GWYER. Yes; I am.

Mr. SOURWINE. Are you familiar with the administration of the Battle Act?

Mr. GWYER. To a limited extent, sir; yes.

Mr. SOURWINE. Can you tell us to what extent the Battle Act is enforced in accordance with its provisions and its basic principles, and to what extent there is opportunity for what might be called amendment of the act through exceptions?

Mr. GWYER. Judging from the reports prepared on a semiannual basis, and these are called reports to the Congress, Mutual Defense Assistance Control Act of 1951, which is referred to briefly as the Battle Act, there was very little use of the provisions provided by this act for the last 10 years.

One of the provisions of the Battle Act is that the United States should deny both economic and military aid to any country which passes on or sends on or licenses shipment of strategic items to the Soviet bloc nations.

Mr. SOURWINE. Has this provision been enforced?

Mr. GWYER. I personally haven't seen a single reference to specific cases where American aid, both military and economic, was denied to a country because of a violation.

Senator KEATING. Was there a violation? In other words, were there such transshipments?

Mr. GWYER. Yes; there are numerous violations, but the problem here enters into a purely political realm, where political considerations become paramount, and a decision to withhold both economic and military aid becomes a matter of national concern, and this is up to the President of the United States to enter into the picture.

I haven't seen, I haven't read in all these reports, including the 14th Report to the Congress on the Administration of the Mutual Defense Assistance Control Act, I haven't seen a single reference where sanctions were used.

Mr. SOURWINE. Is the Battle Act absolutely mandatory in that regard or does it give discretion to the President or elsewhere in the executive branch?

Mr. GWYER. Well, it is entirely up to the President of the United States to invoke the provisions of the Battle Act. If you see certain cases where there were shipments made either by Great Britain or from Italy or from Germany to the Soviet bloc countries, there was a justification made before the CoCom group, and the administrator of the Battle Act, after taking into consideration all the factors, both political and nonpolitical, made a ruling or recommendation that the Battle Act not be used or the provisions of the Battle Act were not to be used or shouldn't be used to enforce, as I say, an exception to the provisions as envisaged by this act.

For instance, we have not a specific but a general hypothetical case. The Soviet Union places an order in Great Britain prior to a CoCom discussion. That item or the items on order are of strategic nature.

Now, this already creates a pressure on the CoCom group on the part of the British representatives to the CoCom who favor relaxations of tensions through trade with the Soviet bloc, to take this item off the international list.

You have the discussions, say, 6 months or 7 months or 1 year after placement of the order, and the British position is "Let's take this item off the list," and I am reasonably sure that because of the pressure the item is dropped from the list.

Consequently, the order is met despite the fact that the order was placed with the British firm 6 months or 7 months or maybe 1 year before the amendment of the international list to which we all agreed.

Mr. SOURWINE. Does the Battle Act depend entirely upon the CoCom list or does it refer to shipments of strategic materials by western European nations on the criteria which we would apply in determining what is and what is not strategic?

Mr. GWYER. Yes. Well, you put it in the proper perspective. But there are the interacting forces which tend to reduce the number of items which are on the Battle Act list.

Mr. SOURWINE. Now, specifically under the Battle Act we are supposed, unless the President decides otherwise, to withhold aid to nations which ship strategic goods to Soviet Russia.

Mr. GWYER. Yes.

Mr. SOURWINE. Is that correct?

Mr. GWYER. Yes; that is correct.

Mr. SOURWINE. Take the case of the 32-ton tube-drawing machine we talked about.

Mr. GWYER. Yes.

Mr. SOURWINE. This certainly is a strategic item.

Mr. GWYER. Yes.

Mr. SOURWINE. Whether or not it is on the CoCom list, it is a strategic item.

Mr. GWYER. Yes.

Mr. SOURWINE. It has been shipped by France to the Soviet Union. Would this be a basis under the Battle Act for the withholding of aid to France unless the President decides otherwise?

Mr. GWYER. This is a question which I would hesitate to answer because it involves the highest responsible level of policymaking.

Mr. SOURWINE. I am not asking you about the policy but only asking you about the applicability of the Battle Act, if you know. If you don't know, you can't testify, of course.

Mr. GWYER. I would rather say I don't know, because I would be guessing here—not guessing but trying to infer in a case of this sort, but my inference might be wrong.

Mr. SOURWINE. I don't mean to force you, but this is of considerable importance to the committee because, on the one hand, if the Battle Act is adequate legislation and does give us the basis for applying sanctions wherever strategic materials are shipped, then there is no amendatory legislation needed.

On the other hand, if the Battle Act has, say, a loophole to the extent that an item may be shipped if it is not on the CoCom list, since we don't actually control the CoCom list but are only in position to negotiate about it, then there might be need for further legislation which would strengthen the hand of this Nation. Do you see why I am asking the question?

Mr. GWYER. Yes; I see, because right at the relation between CoCom and the Battle Act list rests the problem which we are facing today.

Mr. SOURWINE. Do you know, in that regard, whether the Battle Act is adequate to give us the authority to apply sanctions if the administration decides that they should be applied or whether it is inadequate in this regard? Again, if you don't know, you can say so.

Mr. GWYER. Yes; I do know. But if you look today on the situation in western Europe, the time for the application of the economic or military sanctions is gone.

These countries which were built up with American capital, with American investments, in 1951 and 1952 would comply with, say, the demand on the part of the United States when they were depending on our help.

Today this situation is different. We could withhold economic or military aid from West Germany. If I can recall correctly, several years ago when there was talk about pulling American troops out of West Germany, there was an indignant protest on the part of the Germans that we were pulling our defenses out of central Europe, that we were there to protect the West Germans, not only to fortify our international position.

Consequently, in 1952 or 1955, whenever West Germany was depending on our aid to a large extent, we could, with the threat of the usage of the provisions as listed in the Battle Act, have compliance on their part to stop shipping items which we consider strategic to the Soviet Union, to the Soviet bloc.

Today, if you read the quarterly reports, if you go over the testimony of Mr. Stassen given before the McClellan committee in 1956, it appears to me that the political considerations are overriding, and the employment of the Battle Act and the provisions of the Battle Act today just cannot be had.

Let us take a hypothetical case. We maintain bases in Italy. We know that Italy is sending a terrific amount of material which is of a strategic nature, pipeline equipment, pipeline components; we know also that this material goes to the Soviet Union to build the pipelines which the Soviets will use, as a matter of fact, to compete with the Western European oil producers.

Italy, which buys large amounts of oil from the Soviet Union, passes on to the Soviet Union also the equipment of a strategic nature.

We have bases in Italy. I think there is a Jupiter base—Jupiter bases. I think the Army has X number of bases, missile bases.

For instance, you have a statement on the part of the Italian Government saying that, "All right, if you try to apply restrictions on us, if you try to deny us this military aid or economic aid, very simply we are going to abrogate the treaty which allows you to maintain bases on our soil."

This is a political consideration. I couldn't go into the merits of it or the advantages or disadvantages of it, but this is something we have to take into consideration before we begin to think about applying the provisions of the Battle Act, and I think, reading these reports to the Congress by the Battle Act Administrator, this is the general theme you can get from the summarizations here, that this is the case. Political considerations do take first role in decisions of this sort.

I do not know if I made myself clear on this. But——

Senator KEATING. You mean that political considerations outweigh, in your judgment, the considerations of our own national security; is that it?

Mr. GWYER. This is the general impression I gathered over the last 3 or 4 years working in the field of Soviet machine tools; yes.

Mr. SOURWINE. Mr. Gwyer, are you familiar with the fact that the United States has OK'd the shipment of jet aircraft to Yugoslavia?

Mr. GWYER. Yes; I am familiar with it, as much as I read various accounts in the daily press.

Mr. SOURWINE. Have you read anything about this in the Russian or Yugoslav press?

Mr. GWYER. No; I have not.

Mr. SOURWINE. Are you aware that the United States, at the same time it is approving the shipment of these jet aircraft to Yugoslavia, is holding up shipment of wheat to Yugoslavia because it is said we are displeased with something that happened at the Belgrade Conference?

Mr. GWYER. Well, I am aware of it as far as the jets, they have been shipped already; the trainers and jets, Sabre jets have been shipped already. Consequently, the horse is out of the stable.

Mr. SOURWINE. You say the jets have been shipped?

Mr. GWYER. Yes; they have been shipped. This is the impression I gathered from reading some of the accounts.

Mr. SOURWINE. Can you shed any light on the question of why we should ship jet aircraft and withhold wheat?

Mr. GWYER. Well, I would very simply answer this by saying that I personally would be opposed to sending wheat or jet aircraft or any item to Yugoslavia. Although Yugoslavia is, for all propaganda purposes, outside of the Soviet bloc, the spokesman for the Communist Party in Yugoslavia, Mr. Tito, I think, still thinks in terms of world-wide communism, and what guarantee do we have that these jets will be used by the Yugoslavs? I don't know.

The promise, I presume, made by the recipient of these aircraft is that they will be used by Yugoslavia, the Yugoslav air force. But you may have also a secondary effect of it. These Sabre jets and Navy trainers winding up in Yugoslavia will free X number of old obsolete aircraft which are being used today in Yugoslavia; these might be sent to Indonesia or some other place for cash, much more than Yugoslavia actually paid for either the Navy trainers or the Sabre jets.

Mr. SOURWINE. Against whom is there any possibility that these jets are going to be used?

Mr. GWYER. Well, I don't know how they are going to be used, and I don't have the slightest idea.

Mr. SOURWINE. Is there any possibility in your mind that these jets will be used by Yugoslavia against Russia?

Mr. GWYER. I personally doubt if the Yugoslavs will fight the Soviets.

Mr. SOURWINE. Or against any other Iron Curtain country?

Mr. GWYER. I don't know.

Mr. SOURWINE. Do you have any knowledge with respect to the Yugoslav production and need for wheat?

Mr. GWYER. No. My knowledge of Yugoslavia is very limited. I emphasize, I would like to reemphasize, that my basic area of interest is the Soviet Union, Soviet industry basically.

Senator KEATING. The committee will recess now until 2:30 this afternoon.

(Whereupon, at 12:30 p.m., a recess was taken, to reconvene at 2:30 p.m., the same day.)

AFTERNOON SESSION

Senator KEATING. The subcommittee will come to order.

I want the record to indicate that representatives of any of the publications that have been named by this witness this morning, or any of the individuals who were mentioned are at liberty to come before the subcommittee to present any views they may have on the handling of Mr. Gwyer's manuscript for publication.

In the interest of fairness, we shall hold the record open pending communication with these individuals and publications and counsel will notify the persons named that they will have an opportunity to present any views they may wish to present to this subcommittee at a later date.

Counsel will proceed.

TESTIMONY OF JOSEPH A. GWYER—Resumed

Mr. SOURWINE. Mr. Gwyer, I show you a 2-page memorandum on CoCom and the Battle Act and ask you if this is a memorandum which you prepared?

Mr. GWYER. Yes; I prepared this one just recently. This is based on the Ninth Report of the Administrator of the Battle Act to Congress.

Senator KEATING. Is that the last report?

Mr. GWYER. The ninth, not the last. The last is the 14th, dated December 20, 1960.

Mr. SOURWINE. This is, then, a report that you prepared 5 years ago?

Mr. GWYER. No; I have not prepared——

Mr. SOURWINE. How long ago was the ninth report of the Battle Act issued?

Mr. GWYER. I think the ninth report was issued in 1957, if I am not mistaken. I am not positively sure about the date.

Mr. SOURWINE. When did you prepare this memorandum?

Mr. GWYER. I prepared this memorandum just a few days ago; I think it was Friday, Friday night.

Mr. SOURWINE. Why did you base it on the ninth report instead of on the most recent report?

Mr. GWYER. Because the ninth report contains a very detailed reference to the setting up of the structure of the CoCom, the administration of the CoCom.

Mr. SOURWINE. Which is what this memorandum is mainly concerned with?

Mr. GWYER. That is correct, sir.

Mr. SOURWINE. I believe, sir, I read this memorandum as supplementary to the testimony the witness gave this morning about CoCom, and it would be useful in the record.

Senator KEATING. It may be received.

(The memorandum referred to was marked "Exhibit No. 9" and reads as follows:)

EXHIBIT No. 9

COCOM—THE BATTLE ACT

Early in 1949 the United Kingdom and France formulated an Anglo-French list of strategic items, which was similar to, but less comprehensive than, the U.S. lists. The United Kingdom and France sought to induce individual OEEC countries to apply this list. Those countries and others that had already begun restricting security exports to the bloc, developed an acute awareness that the maintenance and extension of individual country controls could be frustrated unless a cooperative device was constructed.

By mid-1949 it became apparent that further progress depended on a multilateral approach to the strategic trade control problem, for coordinated and simultaneous action was essential to effective regulation to dispel the feeling that country A was doing more than country B was willing to do to restrict strategic trade with the bloc. In November 1949, therefore, the bilateral list negotiations were transferred to a multilateral forum and an informal consultative group (CG) was formed in Paris by the United Kingdom, France, Italy, The Netherlands, Belgium, Luxembourg, and the United States. Membership was shortly expanded to include Norway, Denmark, Canada, and the Federal Republic of Germany. These 11 members were subsequently joined by Portugal, Greece, Turkey, and Japan, bringing the current total membership to 15 in this informal, voluntary organization. All the NATO signatories, except Iceland, belong to the CG.

At the outset, members of the Paris group formulated three lists of controlled goods covering items for embargo, quantitative control, and further consideration. These lists subsequently became international lists I (embargo), II (quantitative control), and III (exchange of information and surveillance—that is, items kept under scrutiny which may require control if exports to the bloc appear to be excessive or if new technical or other information indicates the need for more stringent control).

Beginning with the original Anglo-French list as established in 1949, there were progressive additions to the lists agreed upon internationally for embargo and for quantitative or quota control. By April 1952, the three international lists contained some 400 listings, or about 100 less than the items or parts of items covered by the U.S. security lists at that time. The international lists are those which all the cooperating countries have accepted as their minimum levels of control on the items listed. Each cooperating country has its own national control list in administering its export controls and implementing the international understandings.

The multilateral organization on international export controls began operating in Paris in January 1950. The consultative group, which coordinates the strategic trade controls of the 15 members, including the United States, and provides a forum for discussions and negotiations relating to economic defense, is composed of representatives with the rank of minister. Two subordinate working committees perform the day-to-day task of coordinating free world trade controls, overseeing enforcement, and recommending improvement measures. One is the coordinating committee (CoCom), which was conceived at the same time as the CG and began functioning in January 1950. The other is the China committee (ChinCom), which was established in September 1952, with Japan's accession to the group. CoCom is concerned with trade controls applying to the European Soviet bloc; ChinCom concentrates on controls over shipments to Communist China, North Korea, and North Vietnam—controls which are more extensive and stringent than those in effect against the U.S.S.R. and its European satellites. All CG members may participate in CoCom and ChinCom.

The multilateral, cooperative trade control program coordinated by the Paris organization is unique. The group is informal, and participation is voluntary. The unanimity rule prevails with respect to agreements reached, but the final decision in matters before the Paris committees lies with each participating country. The desire for uniform action is the dominant principle that prevails, and it is recognized that there are differing legal, administrative, and policy problems inherent within the sovereignty of the participating countries.

There are criteria for adding and deleting items from the international lists, and for upgrading and downgrading them. Provisions are made for exceptions

authorized on the basis of prior consultation, before- and after-the-fact notification, and special justification.

Many of the activities of CoCom are kept secret, because public disclosure would provide technical and other useful information to the Sino-Soviet bloc to the detriment of free world security, would precipitate and intensify delicate political problems abroad, and would engender commercial pressures in the cooperating countries. Such disclosure could and would be exploited by Communist propagandists in their campaign to divide and weaken the free world.

In December 1951 and January 1952, the 61 countries then receiving military, economic, or financial assistance from the United States were informed of the provisions of the Battle Act and were given the lists of strategic items determined by the administrator under the act. The major provisions of the legislation are explained to the Washington representatives of each of these governments. The important non-Marshall Plan countries were invited to use these lists as guides for their own export controls.

By the end of 1951 and before the Battle Act became law, the cooperating countries had already adopted controls which included the overwhelming number of items on the U.S. security lists covering exports from this country. Discussions in CoCom had resulted in the steady expansion of the lists of commodities agreed for control. Substantial additions had been made in Communist China controls after the aggression in Korea. In addition to the list expansions, constant progress was made in coordinating export licensing and customs procedures for the regulation of exports. The foundation was also laid for controlling the movement of strategic trade through free ports. These achievements were striking in view of the domestic, economic, and political problems that had to be met and overcome in adjusting export control systems to security objectives.

(The following letter from Hon. Douglas Dillon, former Under Secretary of State and now Secretary of the Treasury, was later ordered into the record at this point:)

THE SECRETARY OF THE TREASURY,
Washington, November 7, 1961.

Mr. J. G. SOURWINE,
Chief Counsel, Internal Security Subcommittee, U.S. Senate, Washington, D.C.

DEAR MR. SOURWINE: Thank you for your letter of October 30, advising me of the Internal Security Subcommittee's invitation to comment upon the testimony offered by Mr. Gwyer on the administration of the Battle Act. As the testimony refers to responsibilities which I no longer exercise, I do not believe it would serve any useful purpose to have me take the time of the committee with personal testimony. I will, however, set forth in this letter some comments from my own recollections in the event they may amplify the statements offered by Mr. Gwyer.

As you are aware, the Battle Act provides for the embargo of two separate categories of strategic materials. Shipments which are knowingly permitted by any country to the Soviet bloc of items in the first category, that is, arms, ammunition, implements of war, and atomic energy materials, terminate the U.S. economic, financial, or military assistance to that country upon the recommendation of the Battle Act Administrator. Items in the second category are generally those items considered strategic other than items of the first category. With respect to this second category, Congress has given the President discretion to direct the continuance of aid if unusual circumstances indicate that termination of aid to a country which has knowingly permitted their shipment to the Soviet bloc would clearly be detrimental to the security of the United States. All of the items mentioned in the excerpt from Mr. Gwyer's testimony, which you furnished me, fall into the second category and, so far as I can now recall, the President in each case determined that termination of aid would be detrimental to U.S. security. Each of these shipments was made by a nation which is a participant in the Coordinating Committee, which sits in Paris. Presumably, if the shipping nation understood the item to fall within the list of embargoed strategic materials, it submitted the question of shipment to CoCom and CoCom voted unanimously to permit the shipment. I can recall no instance in which a country shipped a strategic item to the Soviet bloc against the disapproving vote of a participating member of CoCom. On some occasions, there may have been a difference of opinion among participating countries as to whether an item fell within the definition of embargoed items. In such case, great reliance had to be placed upon the good faith of the nation initially

charged with making the determination. Such reliance was obviously appropriate, since the adherence by all participants to CoCom was in the common interest of the participating countries, and presumably any nation which did not recognize this obvious fact would withdraw.

Accordingly, in making his determination that termination of aid with regard to the shipment of a particular strategic item of the second category would be detrimental to U.S. security interests, the President generally was merely confirming an earlier decision of the U.S. Government not to object to CoCom to the shipment. Moreover, I cannot recall any instance in which a failure to submit the question of a shipment to CoCom, or a CoCom determination to permit a shipment of such items, was of sufficient importance to warrant termination of otherwise programed assistance to an ally, granted in the interests of our mutual security.

The foregoing then are the general principles which led to my recommendations as Battle Act Administrator to the President, and presumably to the President's determinations which I subsequently reported to the Congress.

I also note that all but two of the cases in question involved shipments to Poland for use in the Polish civilian economy. Under the last administration, and I believe today, Poland has for reasons of policy been accorded somewhat different treatment than other members of the Soviet bloc. Indeed, in section 101 of the Battle Act, Congress directed the President to assist "the peoples of the nations under the domination of foreign aggressors to reestablish their freedom." The shipment to Hungary, mentioned by Mr. Gwyer, was made in satisfaction of a commitment undertaken before the condensers in question were placed on the embargo list. In the case of the cable shipped by France, the Government of France took the position, with which we differed, that the cable in question did not fall within the definition of proscribed items. While there was an honest difference of opinion between our Governments as to the strategic nature of the shipment, the relationship between the two Governments made it, in our opinion, unwise to apply Battle Act sanctions to enforce our point of view.

In sum, my recollection of the facts does not differ from those set forth by Mr. Gwyer in the extract of his testimony which you forwarded to me. My judgment is that the actions taken were justified by the circumstances existing at the time.

I would appreciate it if you would show this letter to the chairman of the subcommittee and to Senator Keating and convey to them my thanks for this opportunity to comment.

Sincerely,

DOUGLAS DILLON.

Mr. SOURWINE. I show you an article, Mr. Gwyer, entitled "Some Critical Aspects of Soviet Mechanization and Automation Program," and ask you if this is an article you prepared?

Mr. GWYER. Yes; this is an article which I originally submitted to the American Machinist, McGraw-Hill, for publication in December of 1958. As I testified this morning, this article was pulled out from their May issue, scheduled for May publication.

Senator KEATING. Was this the article about which you testified this morning?

Mr. GWYER. Correct, sir, although this article was rewritten to conform to the journalistic style used by American Machinist, with the deletion of all the documentation and references.

Then I submitted this article to Ordnance, American Ordnance Association publication in Washington, D.C., which also rejected it, with the explanation that there was a time element involved, since I wanted to have this item as soon as possible in the press. They could not accommodate this article in the immediate issue.

Ordnance magazine is published every two months.

After receiving this in an envelope from Ordnance Association, I submitted it to Machinery, New York, a publication of the Industrial Press, and it was published in October of 1959. I presume that the subcommittee has the journal proper, with the final version of this article.

One observation I would like to make at this time. A reference to a passage which was deleted from the text, since the motivations for deletion was that this is editorializing, advocating something which I, as a research analyst, should not go into, but should just merely report the facts and analysis based on these facts.

With your permission, Mr. Chairman, I would like to quote this passage.

Senator KEATING. It is short, is it?

Mr. GWYER. It is very short, sir.

In discussing the period of time which it would take the Soviets to attain the goals of full mechanization and automation, I said that it is doubtful if the Soviet Union could attain these goals within the indicated period of time.

It is very doubtful, since a progress toward full automation can only be achieved through a uniform mechanization and this the Soviet Union is lacking. Furthermore, her progress will be slowed down by inadequate number of designers, prototype makers, production engineers, and other highly specialized personnel. It may take her 15 to 20 years with the best training programs and with a full complement of required machines and instruments. This period could be shortened to some extent should the Soviet Union go beyond her sphere of interest for direct and indirect help. There are some indications to this effect contained in Soviet East-West trade proposals, where the primary Soviet interest rests in modern machine tools, and equipment for her chemical industry, and in the engineering know-how, especially that of the United States. Is it not paradoxical that the U.S.S.R., whose aim is to destroy the free world through an economic and political penetration, would turn to the United States, the champion of the free world, for economic help? This zigzag in Soviet foreign policy should be scrutinized in every detail, since it has become a matter of vital importance for the West in general and the United States in particular not to allow themselves to be outpaced by the Soviets in areas of technological and economic progress that would further Soviet gains in the economic war. Lending of support to the Soviet industrialization drive might nullify all Western attempts to contain politically the Soviet Union and might constitute a retreat which eventually may end in a national disaster.

Senator KEATING. That was struck out of even what was published, is that right?

Mr. GWYER. Correct, sir.

Mr. SOURWINE. Mr. Chairman, I would suggest that this article be put into the record as an appendix to the record, but not received as part of the record.

Senator KEATING. It will be received in that manner.

(The document referred to is printed as appendix III at p. 84.)

Mr. SOURWINE. Mr. Gwyer, have you made a study of Soviet press response or reaction to the U.S. policy with regard to exports to Iron Curtain countries?

Mr. GWYER. Yes, I have.

Mr. SOURWINE. What can you tell us about this?

Mr. GWYER. The Soviets, over the period of the last 2 or 3 years, were publishing more or less on a periodical basis in the leading journals, articles which, in a sense, were basically aimed to create an atmosphere that would favor a mutually satisfactory trade between the Soviet bloc nations and the United States. These articles appeared in periodicals such as the Economic Gazette, the Problems of Communism, the Economic Problems, Economic Planning, and so on.

Shortly before the end of the last year, the drive was intensified up to such a point that, practically every single day, there was a reference either in the Soviet press or on Soviet radio broadcasts, to

the effect that trade between the U.S.S.R. and the United States is the only means of reducing international tensions.

Shortly after this subcommittee, under the chairmanship of Senator Dodd, influenced the Commerce Department to cancel the license for shipment of high-precision, high-speed grinders to the Soviet Union, the Soviets intensified their propaganda drive, emphasizing over and over again that this is not the way to reduce international tensions.

Specifically, I would like to quote an article that appeared in Ekonomicheskaya Gazeta dated—for the benefit of the non-Russian speaking audiences, this is the Economic Gazette—dated January 21, 1961.

Senator KEATING. Your quotation will not be long? I would rather put it in the record if it is going to be long.

Mr. GWYER. Since this item will be introduced in the record, I may say that—there are only two lines here:

It expresses the hope that the quarters shaping the trade policy of the United States would take a more realistic position on the question of Soviet-American economic relations.

Senator KEATING. Did they have reference specifically to this ball bearing machine shipping?

Mr. GWYER. No; this one does not. This is one of the run-of-the-mill articles dealing with the general pattern of East-West trade.

Senator KEATING. You speak of propaganda. That is published in Russian, is it not?

Mr. GWYER. Yes, this is published in Russian for Russian consumption.

Senator KEATING. What propaganda value does it have outside Russia?

Mr. GWYER. This item was radio teletyped in English to Europe on January 21, 1961, at 0834 Greenwich mean time.

In direct reference to Senator Dodd, I would like to quote brief statements made here by Radio Moscow, and this was again propaganda beamed to eastern North America on March 4, 1961.

Senator KEATING. And to European countries, too, or just here?

Mr. GWYER. North America. Actually, I think, broadcasts to the eastern North America are heard very well throughout northern Europe, and western parts of Europe. As a matter of fact, I think I heard this one here myself, listening to Soviet broadcasts and watching for the reaction of the Soviets to the cancellation of the license. Since this is quite extensive coverage, I wonder if you would like me to——

Senator KEATING. We will receive it in evidence and proceed. We will receive all these in evidence.

Mr. SOURWINE. I have two others which perhaps might be offered this same way, Mr. Chairman, rather than having the witness comment on them, if the Chair pleases.

Here is an article from Izvestia, March 7, 1961, referring specifically to the activity of this committee. The caption in the Russian newspaper is "McCarthyites and Export."

Senator KEATING. It will be received.

Mr. SOURWINE. The English translation, of course, is what should go in our record.

(The document referred to was marked "Exhibit No. 10" and reads as follows:)

EXHIBIT No. 10

[From Izvestia, Mar. 7, 1961, p. 1]

McCARTHYITES AND EXPORT

The Washington AP correspondent reported recently that the U.S. Department of Commerce annulled a previously issued license to the "Bryant Co." for export to the U.S.S.R. of 45 precision grinders.

How can this decision be explained?

Judging from the report by Senator Thomas Dodd, Democrat, of Connecticut, it is nothing more nothing less but the security of the United States and that of the "free world." Dodd, appearing as the vice chairman of the Senate Internal Security Subcommittee described the decision of Commerce Department as wise. "* * * denying the Soviet Union these machine tools," said Dodd, "and retaining them for the American industry, the Secretary of Commerce strengthened the free world and weakened the Communist world."

What kind of nonsense the overvigilant Senator is spilling!

It is necessary to point out that the grinder business is being dragged for quite a while. In the first place, their (grinders) shipment to the Soviet Union was held up last year by the Eisenhower administration. Then, the prohibition of sale was reversed on the basis that the U.S.S.R. could purchase such machine tools in other countries. With the advent of the Kennedy administration, the Secretary of Commerce Luther Hodges, under pressure from the business circles became inclined to allow the sale of these machine tools. It was then that Dodd rushed in with a malicious attack against the development of trade with the U.S.S.R. He also asserted that the U.S.S.R. was interested in these machine tools for their rockets.

Is it possible to think of a more flimsy argument to interfere in the development of trade between the United States and the Soviet Union. The whole world is aware that in rocket technology the United States lags well behind the U.S.S.R. Does Senator Dodd know that Soviet automatic (space) station launched from a huge satellite is moving in the direction of Venus.

Senator Dodd not only stopped American industrialists from making profitable deals but also denied bread to many workers. Learning about the stupid decision of the Commerce Department, many are praising both Dodd and Hodges.

Today in Izvestiyakh (sic) we are publishing information on the hard consequences of unemployment (in United States). Among other things, the development of trade on mutually satisfactory terms could considerably lessen the suffering of many thousands unemployed in the United States. But Senator Dodd is not interested in this. He saddled his wornout cold-war horse and by rushing him he is demonstrating that the late Senator McCarthy still has followers in the United States.

N. KUZNETSOV.

Mr. SOURWINE. Here is a statement by the Chief Specialist of the State Committee for Automation and Machine Manufacturing with the Council of Ministers of the U.S.S.R. from the Economic Gazette of September 11, 1961, and the English translation.

Senator KEATING. It will be received.

(The document referred to was marked "Exhibit No. 11" and reads as follows:)

EXHIBIT No. 11

[Source: N. Shamin, chief specialist of the State Committee for Automation and Machine Manufacturing with the Council of Ministers of the U.S.S.R.]

"NET NE TAKOY METALL NUZHEN MASHINOSTROITELYAM!" (NO, SUCH METAL IS NOT NEEDED BY MACHINE MANUFACTURERS) (IN EKONOMICHESKA, GAZETA, SEPT. 11, 1961, P. 10)

The development of all branches of national economy depends to a large extent on metallurgy. The volume of metal produced, its grades, and high quality are obviously very important to the machine manufacturing industry—the latter being the heart of a modern industrial development.

During the later years, the rate of growth of metallurgical output rose very sharply. New blast furnaces and open-hearth furnaces, unique in terms of capacity, both metal rolling and other equipment introduced into being, considerably increased the general industrial potential of the country. The metallurgist learned to produce new types of steel and steel shapes, the technical—economic indices were improved in general for various metallurgical enterprises.

But the requirements of machine builders grow and today it is important to talk not only about successes but also about deficiencies apparent in the development of metallurgy, about shortcomings which in final analysis may lead to quite undesirable consequences.

Let us begin with the fact that power, chemical, transport, food, and other branches of machine manufacturing require metal of a new type with specific properties. We need heat-resistant, erosion-resistant, spring, nonmagnetic steel with specific strength and wear-resistant properties, capable of use in aggressive media, at high temperature, etc. Among others the process, and basically the rate of growth of development of such steels and alloys as of now are altogether unsatisfactory. Resistance alloys, for example, are being produced in extremely limited amounts, and the quality of these leaves much to be desired. In their place we are compelled to use alloys containing high amounts of deficient nickel.

There is a great need for so-called automatic steel which possesses high degree of machinability. As of now the metallurgists are producing obsolete types of such steel. During the last 30 years we have developed only one grade of high alloy well machinable steel for the watch industry.

It is interesting to note that the machine builders themselves in their own plants using whatever means available at their disposal successfully produced various types and grades of high quality metal. This is to a known degree a paradox since a metallurgical enterprise equipped with the highly capable and modern equipment and technology, it is much more simple to produce high quality metal. Prior to the war the new Kramatorsk plant produced one grade of nonmagnetic steel for making parts for electric generators. The need for this metal is great. But, metallurgists spreading their hands haven't produced similar type of metal.

Case like this can be only considered as a manifestation of narrow-mindedness and indifference to the interest of the entire national economy. This can be attested by the situation in respect to rolled steel. The number of grades of rolled steel is very limited, altogether about 600-type sizes, when foreign firms produce them in several thousands of type-sizes. More than 60 years existed the old grade of I-beams and sleepers, but it took 5 years for the metallurgists to decide in January of 1960 to go into production of this type of product in new grades.

On rail mills similar to the one in the Azovstal plant, the steel men in the United States produce beams with a shelf width of up to 300 millimeters, but we are turning them out with widths of only 185 millimeters. It is known that a beam of this width can take a much greater load and consequently will permit savings of many tons of metal.

The limited assortment of rolled steel denies the designer the possibility of using all the advantages of low alloy steel. The gist of it is that its increased strength characteristics often do not permit the use of profiles of smaller dimensions since such substitute does not provide the necessary margin of strength. For a number of grades (I-beams, sleepers, and others) it is necessary to establish intermediate sizes.

The industry did not master the production of pipes for ball bearings up to 25 millimeters and above 180 millimeters. A large economy of metal, up to 50 percent, may be found by using profile pipes and bend profiles, but metallurgists are still manufacturing only the most simple types of pipe and bend profiles which give only a very limited effect.

June 1959 plenary session of the Central Committee of the Communist Party of the Soviet Union adopted a resolution on the wide use of the oil and gas industry of drill pipes of reduce (sic) and small diameter. But industry is compelled to use pump-compressor pipes in place of drilling pipes because the latter are not being manufactured by the metallurgists. The industry does not produce flangeless well pipes whose use would reduce by a factor of two the number of threaded joints and would improve the air tightness as well. The extra tolerances of oil pipes in terms of diameter and weight amount to a loss of between 20,000 to 25,000 tons of pipes.

There is no production of sheets, strips, and pipe coated with plastic which is widely used by foreign industry.

Curiously enough there is apparently no organization which would compel metallurgists and steel rollers to produce for the industry necessary types of products. The creation and planning of new types of grades is obviously a job for VNIIMetmash. Director of this institute Comrade Tselikov promised to tackle this problem, but obviously he forgot about his promises. In any case, there are no results in that direction coming from the work of the institute. It is obvious that the development and production of new grades steel and also of rolled steel should be more fully considered in the objectives for new technology on par with the objectives for the production of most important machines and equipment.

Great apprehension is caused by the low quality of metal. Quite often metal is delivered without proper heat treatment, not straightened with the crushed edges and with a great decarbonized core, contaminated with foreign and detrimental mixtures, with extremely great tolerances in terms of size, and with unstatisfactory micro-macro structure.

The wide use of welding and automation of technological processes demands from a metal increase requirements. This means a lowering of detrimental admixtures and a maximum homogenity in terms of chemical composition, structure, mechanical properties, and also in terms of shape and uniformity of geometric dimensions. The country gave metallurgists all the necessary means to fulfill these requirements; new units for gas and sulfur purification were built, open hearth furnaces were equipped with the ducts made from heat resistant refractories (bricks), some of them were converted for the use of the purest natural gas, furnaces were automated, powerful milling mills were erected, and modern auxiliary equipment was provided. Many billions of rubles went into the development of metallurgy but a corresponding return from the metallurgists in terms of increase quality of production was not realized.

The level of mechanical properties of carbon and alloy steel during the past decades did not change. The allowance for the content of detrimental of admixtures remains as it was, and the content of admixtures such as copper, arsenic, and nickel even increased above the original standards. The finishing of metals judging from the current output did not improve.

Foreign firms during the last years considerably increased the quality of produced metals and especially the mechanical properties of most commonly used carbon steel CT–3 by its thermal finishing during the production process. Such a finishing can be attained without any considerable capital investments also by our metallurgical plants.

Increase product quality could give the state a tremendous advantage. Here are a few examples:

According to the 7-year plan, we are supposed to double the output of steel wire cable and in order to attain this it is contemplated to build three wire cable plants out of a cost of 150 million rubles. This construction could be avoided if the service life of wire cable was doubled. The work of the Kharkov mining institute and the mining institute of the Academy of Sciences of U.S.S.R. show, that it is possible to increase the service life of wire cables used in mining by a factor of anything between 2 and 4. All it is necessary is to improve their design and basically to increase the quality and uniformity of the wire strand.

Second example: Tool steel—increasing the tool stability by a factor of 2 would eliminate the need for a construction of a new tool plant. In order to attain this it is necessary to lower the carbide nonuniformity of high speed steels, to provide the steel with a good structure, without the decarbonize core, with a uniform and pure (free from detrimental and foreign admixtures in a chemical composition). It is obvious that it is also necessary to pay attention on the quality of the sharpening of tools. Up until now, gear and slot milling is carried out in our plants at cutting speeds of 30 to 38 meters per minute, about one half as fast as on establishment of better foreign firms.

Heating elements of electric furnaces manufactured by our metallurgical plants from resistance alloys, perform five to six times less in terms of time than elements imported from abroad. The excessive use of deficient, highly expensive metals, for example nickel is the result.

It is possible to present still a number of examples proving that a low quality of metal brings the country tremendous losses. Specifically because of the low quality of transformer iron, the country is losing power equal to that generated by the Volga GES IM Lenin.

One of the causes of all these deficiencies, of these shortcomings is the unsatisfactory state of standardization. Isn't it strange that despite the fact that procedures are turning out low quality items, the metallurgists do not violate the standard requirements, which almost is on the edge of appearing defective.

The standard is a powerful lever leading to the improvement of product quality. Its increased requirements should lead to a continuous improvement of the product, to its increased service life and strength. And what is attained in reality? And actually the requirements of GOST are being reduced in comparison with the results attained in practice.

From 245 melts of steel type 27 SG conducted on the Kirov plant in Leningrad, only one did not correspond to the standard requirement for the breaking down point. Remaining were 15 to 20 percent higher than those required by GOST.

The standard specifies that the flow limit of widely used steel type 40 Kh should be equal to 90 KGmm. From 184 melts conducted by the Kuznetsk combine, only 10 gave lesser results. The flow limit of remaining steel was 15 percent higher than specified by the new standard which is being prepared for official sanction.

It should be directly stated here that the position taken by the Committee on Standards does not facilitate a constant improvement of product quality because a poor standard not only makes defectives legal but also prevents their elimination. And today when the objectives of the program of the Communist Party sets forth before our country these great objectives, the practice as above should be completely changed.

The most important, it's now time to understand (learn) that metal should not be produced for the sake of metal. This metal is necesary in the first place by the machine manufacturer, and consequently the requirements of this most important branch of the national economy should be considered and should be binding in the development of Soviet metallurgy.

Mr. SOURWINE. Here is an English translation of an article which appeared in the Economic Gazette of January 21, 1961, at page 4, which was also a Tass radio teletype in English to Europe.

Senator KEATING. It will be received.

(The document referred to was marked "Exhibit No. 12" and reads as follows:)

EXHIBIT No. 12

UNITED STATES DISCREDITS SOVIET TRADE ACTIVITY

[Moscow, TASS, radioteletype in English to Europe, Jan. 21, 1961, 0843 GMT—L]

(Text) Today's Economic Gazette devotes a lengthy article to Soviet-American trade. It expresses the hope that the quarters shaping the trade policy of the United States would take a more realistic position on the question of Soviet-American economic relations. The line toward curtailment of Soviet-American trade so far resulted only in the loss by American industry of many billions worth of orders, the paper says. Is it not too high a price to pay for the foredoomed attempt of the anti-Soviet circles in the United States to halt the development of certain branches of Soviet industry, the paper asks. This becomes particularly clear, the paper stresses, in view of the economic difficulties now experienced by the United States—millions of unemployed and the difficult position of the dollar.

As stressed by the newspaper, the Soviet Union from the very first days of its existence has been advocating peace, international cooperation, and development of international trade on the basis of equality and mutual advantage. Now that the peace forces in all parts of the world are persistently fighting to avert another war, such trade becomes a particularly effective means of easing international tensions.

In this connection the paper points out that the tremendous economic and technical achievements of the Soviet Union have made the bankruptcy of the policy of restricting trade with the U.S.S.R. evident to everyone. Now that there is a new upsurge in the economic development of the Soviet Union, Soviet foreign trade organizations can offer the United States traditional items of Soviet-American trade in greater quantities than ever before, as well as a number of new goods.

Economic Gazette points out that the U.S.S.R. is now trading with mutual advantage with more than 80 countries, including Britain, France, and the German Federal Republic, the total annual volume of trade exceeding $10 billion. Life has long since proved, the article says, that the principles of the Soviet foreign trade system in no way infringe upon the interests of the Soviet Union's partners in economic operations. These interests are fully guaranteed by the equal trade treaties and agreements which carry the signature of the Soviet Union.

The paper concludes by stressing that the arguments advanced by the opponents of the development of Soviet-American trade are groundless and that Soviet foreign trade activity is discredited most of all in precisely the countries which have no substantial trade contacts with the Soviet Union.

Mr. SOURWINE. Here is a broadcast from Moscow in Hungarian to Hungary, February 20, 1961, which also is a specific commentary on the activities of this committee.

Senator KEATING. It will be received.

(The document referred to was marked "Exhibit No. 13" and reads as follows:)

EXHIBIT No. 13

DODD ACCUSED OF REVIVING COLD WAR DAYS

[Moscow, in Hungarian to Hungary, Feb. 20, 1961, 2030 GMT—L (Victorov commentary)]

Senator Dodd began his career as an agent of the Federal Bureau of Investigation, that is to say, as a police agent. He has kept his policeman's mentality up to this day. Those who doubt this should scrutinize the Senator's speech at the so-called American-German conference. According to UPI, Dodd said at that conference that the primary objective of U.S. diplomacy should be nothing more nor less than the so-called liberation of East Germany and Eastern Europe. In plain language this means subjugation. To achieve this target, said Dodd, suitable disruptive activities should be pursued.

What can one say about such statements, of which even Dulles would have been envious? Such statements can be described only as brazen intervention in the internal affairs of sovereign states, the majority of which maintain diplomatic relations with the United States. Dodd belongs to that circle of the U.S. Democratic Party which is trying to revive in America's policy, not Franklin Roosevelt's noble traditions, but the methods of Truman and Acheson who, as is well known, laid the foundations of the cold war. But the days when gentlemen like Dodd and their protectors decided the fate of the world have gone forever.

The political countenance of Senator Dodd has been known for a long time. Linus Pauling, the well known U.S. scientist and peace fighter, said of him: "I believe that he is one of our enemies who is in the imperialists' camp." We must agree with Pauling's words. Dodd's speech was aimed at sharpening the international situation and at reviving the most terrible days of the cold war. Mr. Dodd has rendered a very bad service to the people of America.

Mr. SOURWINE. Here is the English translation, the text of a Moscow broadcast in English to eastern North America, March 4, 1961, specifically referring to the cancellation of exports to the U.S.S.R.

Senator KEATING. It will be received.

(The document referred to was marked "Exhibit No. 14" and reads as follows:)

(EXHIBIT No. 14)

U.S. CANCELING OF EXPORTS TO U.S.S.R. HIT

[Moscow, in English to eastern North America, Mar. 4, 1961, 2319 GMT—L (unclassified]

(Nina Alekseyeva commentary)

(Text) The discussion over selling the Soviet Union a shipment of grinding machines started while Eisenhower was still in office. American idustrialists pointed out that such a bargain was feasible, and profitable as well. Even the

Commerce Department approved the deal. But now it has decided to annul the export license previously handed out. What is behind all this?

Roscoe Drummond of the New York Herald Tribune explains the denial by the fact that the United States is afraid that these machines will help the Soviet Union to breach the gap in the field of rocketry. If such is really the case, then something is wrong somewhere. First of all, American specialists themselves consider that the United States is several years behind the U.S.S.R. in the building of rockets, and if we speak about help in this field then probably the United States needs it most of all. What is more, the machines under discussion are very remotely connected with rockets.

Senator Dodd, vice chairman of the Senate Internal Security Subcommittee, said: "The Commerce Department had made a wise decision." He considers that the decision strengthens the so-called free world and weakens the Communist world. I do not know whether this decision strengthens or weakens one world or the other. One thing is certain. It intensifies the cold war.

As for the assertion concerning the weakening of the Communist world through such measures, I think Senator Dodd is making the same mistake his predecessors made 10 years ago. They followed a discriminatory trade policy toward the Soviet Union, thinking that it would retard the industrial development of the U.S.S.R. However, it was precisely in these 10 years that the Soviet Union made astounding progress in its national economy. The U.S.S.R. was the first to build (word indistinct) station, the first to fire earth and solar sputniks into space. The U.S.S.R. was the first to send a spaceship bound for Venus.

Senator Humphrey was right when he said that America's containment trade policy often serves as a stimulant for the Soviet Union to step up and expand industry. Of course, the case really does not concern a few dozen grinding machines. We have done without them so far and will manage without them in the future.

I believe that Luther Hodges' decision was prompted by the reluctance of influential American circles to establish normal trade relations with the Soviet Union. We regard the normalization of trade between our two countries as one of the factors improving Soviet-United States relations. The Soviet Union is showing by its deeds, not by words, that it is doing everything possible to relax tension between our two countries right now and we think that the normalization of Soviet-United States trade relations could be one of the most important steps toward liquidating this tension.

Mr. SOURWINE. That concludes the list of those offerings.

Mr. Gwyer, you testified this morning, not in great detail, with regard to the administration of the Battle Act. Are you familiar with the 1960 survey of the strategic trade and control program? I show you this volume.

Mr. GWYER. Yes; I am.

Mr. SOURWINE. Will you comment on that, please?

Mr. GWYER. The provisions of the Battle Act of 1951 require the Administrator of the Battle Act to provide the President with a report on any determination made pursuant to the first proviso of this section; also the Senate Foreign Relations Committee, the House Foreign Affairs Committee, and other committees of Congress—there are six committees, altogether, interested and the six committees were informed on the foreign determinations made from January through September of 1960.

To recap, the provisions of the Battle Act state that the United States, if necessary, as directed by the President, may use economic and military sanctions against any country which trades with the Soviet bloc in items which we do consider strategic. This is communication—there is X number of communications by the Adminis-

trator of the Battle Act, Douglas Dillon, then Undersecretary of the State Department.

Mr. SOURWINE. You need not read these communications. They can be offered for the record, if you have comments about them. Do you have comment about them?

Mr. GWYER. I have a comment, since these are items which we do consider strategic, but they were shipped anyway to the Soviet bloc nations.

Senator KEATING. What kind of items are those?

Mr. GWYER. Cable and communications equipment to Poland for civilian use.

Senator KEATING. I didn't hear that.

Mr. GWYER. This is cable and communications equipment to Poland for civilian use; grinding machines to Poland for civilian use; condensers to Hungary; cable to Soviet Union from France; borax shipments from Italy to Poland; shipments of certain bearings to Poland from Japan.

The provisions of the Battle Act were not used and, in the words of the Administrator of the Battle Act:

> I recommend that the United States, in its own security interest, should continue aid to these countries.

Senator KEATING. Who was the Administrator then?

Mr. GWYER. Douglas Dillon, Under Secretary.

Senator KEATING. Does he, in that communication, go into detail as to why he reaches that conclusion?

Mr. GWYER. If we go into the cable and communication equipment Poland for civilian use, Mr. Dillon goes to explain that this represented this part of telecommunications network to be on Polish territory and which was to connect Poland with various Western countries through Denmark.

Senator KEATING. Is there anything to stop the Poles, when they—from using it for a purpose that it was not asked for?

Mr. GWYER. I personally don't think so; unless the Department of Commerce, through its enforcement agencies, can see to it that this item is used for this specific purpose and for nothing else. But I could not comment on the role played by the Department of Commerce in this case.

Similarly, I don't think we have any assurances that an item which was received by Poland or by Hungary, despite the declarations on the part of either of these two countries, that this item will be used exclusively on the territory of either Poland or Hungary, that these items will not wind up eventually in the Soviet Union. I could not, in all honesty, go into it and say that we have or we do not have ways of enforcing it.

Mr. SOURWINE. Do you know of any way we have of enforcing it?

Mr. GWYER. No; I do not.

Mr. SOURWINE. May the particular communications which are printed in this report which have been commented upon be included in the record, Mr. Chairman?

Senator KEATING. They may be received.

(The communications referred to, as printed in the 14th (1960) report of the Administrator of the Mutual Defense Control Act to Congress, were marked "Exhibit No. 15" and read as follows:)

EXHIBIT No. 15

APPENDIX D, (PP. 31, 32)

PRESIDENTIAL DETERMINATIONS MADE JANUARY–SEPTEMBER 1960

Section 103(b) of the Mutual Defense Assistance Control Act of 1951 provides that the President shall report any determination made pursuant to the first proviso of this section to the Senate Foreign Relations Committee, the House Foreign Affairs Committee, and the Senate and House Appropriations and Armed Services Committees. The six committees were informed of the following determinations made from January through September 1960:

"DEPARTMENT OF STATE

"WASHINGTON 25, D.C., *January 16, 1960*

"SIR: The President on January 7, 1960, determined, pursuant to Section 103(b) of the Mutual Defense Assistance Control Act of 1951, that United States aid be continued to Denmark, the Federal Republic of Germany, France, Italy, and Japan because the cessation of such aid would clearly be detrimental to the security interests of the United States.

"The President, in his letter to me directing that aid be continued, also directed that, in compliance with the reporting requirement of Section 103(b) of the Act, I inform you of his determination, to which purpose this letter with enclosure is sent.

"Very truly yours,

"DOUGLAS DILLON
"Under Secretary

"DEPARTMENT OF STATE

"WASHINGTON 25, D.C., *December 31, 1959*

"DEAR MR. PRESIDENT: As required by Section 103(b) of the Mutual Defense Assistance Control Act of 1951 (Battle Act), I am advising you herewith of certain shipments to the Soviet bloc of Control Act embargo items by countries receiving United States assistance and recommending to you that assistance to these countries be continued.

"This report covers shipments which have not been covered by any previous Presidential Determinations under Section 103(b) of the Control Act. The countries involved in the shipments and the circumstances under which they were made are as follows:

"DENMARK

"Denmark shipped $145,000 worth of cable and communications equipment to Poland for civilian use. This represented that part of a telecommunications network to be on Polish territory and which was to connect Poland with various Western countries through Denmark.

"THE FEDERAL REPUBLIC OF GERMANY

"The Federal Republic of Germany shipped to Poland for civilian use a grinding machine valued at $11,514; and shipped to Hungary $3,214 worth of condensers. These latter represented a prior commitment; that is, a commitment had been entered into to export these before they were put under embargo in August 1958. It has long been recognized that, in the absence of unusual circumstances, prior commitments are to be honored.

"FRANCE

"France shipped $692,086 worth of cable to the Soviet Union. This was part of a larger quantity licensed for shipment by French authorities who considered cable of those specifications not covered by the definitions of embargoed items.

United States authorities did not agree with this interpretation and consider this item to be covered by the Battle Act embargo. France also shipped $34,500 worth of electronic tubes to Poland for civilian use.

"ITALY

"Italy shipped borax valued at $11,260 to Poland for civilian uses.

"JAPAN

"Japan shipped $7,040 worth of certain bearings to Poland for civilian use.

"CONCLUSIONS AND RECOMMENDATIONS

"Except for the French cable to the Soviet Union and the German condensers to Hungary, the circumstances of which are explained above, all the shipments enumerated above went to Poland for specified civilian uses. All but the French case were presented for consideration in the international security trade control body (COCOM) before the export was authorized. The exporting countries listed above have cooperated for ten years in controlling strategic shipments to the Soviet bloc. The European countries mentioned make important contributions to the North Atlantic Treaty Organization. United States aid to these countries is largely military aid, enabling them to meet their NATO obligations, thus enhancing the security of the free world, including the United States. In the light of the foregoing considerations and having taken into account each of the statutory criteria set forth in the first proviso of Section 103(b) of the Battle Act, I recommend that the United States, in its own security interest, should continue aid to these countries.

"The recommendations in this letter are based on the advice of Vice Admiral Walter S. DeLany, USN (Ret.), my Deputy Administrator for the Mutual Defense Assistance Control Act, and are also concurred in by the Departments of Defense, Treasury, and Commerce, and the International Cooperation Administration.

"Respectfully submitted,

"DOUGLAS DILLON,
"*Under Secretary.*

"The President,
"*The White House.*"

Mr. SOURWINE. Mr. Gwyer, in the case of materials for export which are not strategic in our normal commercial relations with Western European countries, is it safe always to regard the same items or articles as nonstrategic in dealing with the Soviet bloc, and if not, why not?

Mr. GWYER. A terminology of strategic or nonstrategic should be considered against the background of the nation which uses the item labeled either strategic or nonstrategic. In our dealings with the Western European nations an item which is nonstrategic by all the definitions may be strategic to the Soviet Union.

An item may be considered as strategic when it is of dire need by a certain economy which, without it, is impeded in its operation. You may have a directly military strategic item and may have a nonmilitary strategic item. Both of these are equally contributing to the development of a country. Since the Soviet Union is a state where the government is in full control of all the facilities, manpower, resources, an item which, by our definition, is defined as nonstrategic, this item going into the Soviet bloc may decome strategic through inference. An item the Soviets need may be produced in the Soviet Union, but in order to do this they would have to divert resources and manpower and facilities for that purpose. By purchasing this item abroad, they are in a position to channel their resources, their manpower, into produc-

tion of items which they do consider of either military or propaganda value.

There is a problem of shifting these resources, rather than having these resources used to produce either buttons for the army uniforms, or perhaps a potato peeler, or items of this sort. Of course, I am trying to minimize the importance of the term "strategic." I don't think we have a potato peeler on the positive list but just for analogy purposes, the fact of the Soviet Union purchasing 50 million potato peelers, say in Western Germany, will allow them to channel the manpower and the facilities and the machine tools or hydraulic presses, or whatever they use for this purpose, for production of items of direct military use.

Mr. SOURWINE. I think perhaps your illustration of potato peelers is a little unfortunate. Are you trying to say that anything which the Soviet Union wants and which we ship to them can be said to have some measure of strategic value because, if they need it at all, their acquisition from us releases some productive capacity within the Soviet Union? Is this the point you are making?

Mr. GWYER. What I am trying to point out is that an item by Soviet standards is strategic when they have to set up certain priorities to produce an item which requires the machine tools and facilities and floor space and manpower. If they are in a position to purchase this item abroad, this releases this segment of their industry to produce something which they need and which they cannot purchase abroad.

Mr. SOURWINE. Are you leading up to or are you stating the conclusion that we shouldn't ship anything to the Soviet Union through the Soviet bloc?

Mr. GWYER. Well, there are two schools of thought. One is that we have to maintain some sort of trade relations with the Soviet Union for the sake of diplomatic relations. I personally believe that any item of significance, and the Soviets are purchasing the items of significance on the Western markets, should not be sent to the Soviet Union.

Mr. SOURWINE. Do you have any information, Mr. Gwyer, respecting the shipment of diesel electric locomotive trains from the United States to the Soviet bloc during 1960?

Mr. GWYER. No; I do not have direct information on the shipment.

Mr. SOURWINE. Do you have any direct information respecting any particular shipments in recent years from the United States to the Soviet bloc which you consider of major strategic importance other than the grinding machines that we have already talked about?

Mr. GWYER. Yes.

Mr. SOURWINE. Tell us about them.

Mr. GWYER. You have—now, again, I have to distinguish between the Soviet bloc nations as identified by the Department of Commerce. My definition of Soviet bloc nations includes Poland and Yugoslavia.

Senator KEATING. You mean they don't classify them as Soviet bloc?

Mr. GWYER. No; they do not classify them as Soviet bloc nations for export purposes, trade purposes. There are instances of shipments of rubber, metal—scrap metal, to be exact—of vehicles, of loaders——

Mr. SOURWINE. Loaders?

Mr. GWYER. Yes, sir. Actually, if someone would refer to the Bureau of Census monthly reports on actual shipments of goods from the United States to these countries, including Yugoslavia and Poland, they would have a list of maybe 150 or 200 items, or so, which are quite significant in terms of their strategic value to the Soviet Union. They perhaps may not be classified by our standards as either of primary strategic importance or even secondary strategic importance, but they are strategic to the Soviet Union.

Senator KEATING. Are you referring to shipments to the Soviet Union on the one hand?

Mr. GWYER. Soviet Union, Poland, Bulgaria, Czechoslovakia, Rumania, Hungary, Yugoslavia, and Poland. If we take these countries and lump them together, because they should be lumped together, then you have a complete picture of the Soviet bloc.

Mr. SOURWINE. Have you made a compilation of these items from the Commerce Department reports? You are just telling us what you happen to remember? You have not made a list of them?

Mr. GWYER. Personally, I would hesitate to comment on it because of the nature of the work I am doing right now. Perhaps you understand my position. I am aware of X number of shipments going on to the Soviet bloc nations, but this ties up with the position I am holding at the present time.

Mr. SOURWINE. Mr. Gwyer, do you mean that you have information which you have received in a classified way that you can't discuss in an open public hearing?

Mr. GWYER. No; this is not of a classified nature, but perhaps because of my association with the group I am with right now—this will be entirely up to the committee chairman—should I divulge it or not?

Mr. SOURWINE. All right, we accept that.

I show you, Mr. Gwyer, an excerpt from the publication, Swiss Review of World Affairs, April 1961, headed "East-West Trade in Europe."

Is this an article to which you have called the committee's attention?

Mr. GWYER. Yes; I have.

Mr. SOURWINE. What was your purpose in calling this to our attention?

Mr. GWYER. Basically, looking on the statistics covering the East-West trade, the figures for trade between the United States and the Soviet Union or the Soviet bloc, are relatively insignificant in comparison with the overall total trade between the Soviet bloc nations and the nations of Western Europe; namely, Italy, West Germany, France, and Great Britain.

Mr. SOURWINE. Is this an article which you consider authentic and reliable?

Mr. GWYER. Yes; I do, because these figures can be found also in Soviet publications dealing with the foreign trade.

Mr. SOURWINE. You are suggesting, then, that this article be included in our record?

Mr. GWYER. I would like to see it included in the record.

Mr. SOURWINE. May it be included, Mr. Chairman?

Senator KEATING. Received.

(The document referred to was marked "Exhibit No. 16" and reads as follows:)

EXHIBIT No. 16

[From the Swiss Review of World Affairs, April 1961]

EAST-WEST TRADE IN EUROPE

By a correspondent

Although the Communist countries of Eastern Europe occupy a very important place on the Continent as far as their area, population, industrial, and agricultural output are concerned, their exchange of goods with the non-Communist countries of Europe is comparatively small. Nevertheless, the past 3 years have shown that in spite of numerous barriers, European East-West trade is expanding. In view of the long-term agreement concluded last year between the U.S.S.R. on the one hand and Britain, Italy, and the German Federal Republic on the other, one may expect a further growth of this trade.

Of the $46.7 billion worth of goods imported by the OEEC countries in 1959, only $1.68 billion worth came from the East bloc, and of the $43.7 billion worth of goods exported by the OEEC countries in the same period, only $1.4 billion worth went to the East bloc.

There are several reasons for the relative insignificance of trade between the OEEC countries and the East bloc. Most of them have their origin in the bloc's economic system. The government monopoly of trade in the Communist states, the inconvertibility of East-bloc currencies and the endeavors of East-bloc nations to arrive at a favorable or at least equalized balance of trade on the basis of exclusively bilateral relations, prevent the volume of trade from growing to any larger extent, although there is a tendency in that direction. All East-bloc currencies being "internal" and their export a criminal offense, trade is conducted on the basis of the dollar and only surpluses are settled in cash. Quite generally, East-bloc trade has the character of barrier transactions. The East bloc exports so as to be able to import. When an East-bloc state achieves any considerable export surplus, the resulting foreign exchange is, as a rule, used to pay for excess imports from other countries. Only in the case of an emergency—when it is absolutely impossible to achieve an export surplus or when the urgent need of certain goods justifies their purchase in the eyes of the planners—payment may be effected in gold, preferably through the U.S.S.R.

Up to the present these peculiarities of East-bloc trade have influenced also the formation of export prices. In fixing these prices East-bloc trade authorities were not bound by the domestic structure of prices and costs; they observed world-market prices and fixed their own below these.

The East bloc's endeavor to achieve a favorable balance of trade is clearly visible. Like the 18th century Mercantilists, the Communist trade functionaries today are trying to sell more than they intend to buy. Beside Finland, Italy, and the German Federal Republic, Great Britain is the most important trade partner of the East bloc in Europe.

The bloc's principal trade partner among the Scandinavian countries is Finland. In 1959 Finland took nearly half ($207 million) of Scandinavia's imports from the East bloc, and exported to it for $196.5 million. Finland's principal trade partner among East bloc countries is, of course, the U.S.S.R. Nearly three-fourths of Finland's imports from East bloc countries came from the Soviet Union ($147.3 million in 1959), and three-fourths of its exports went there ($140 million in 1959).

Trade between the United Kingdom and the East bloc

[In millions of pounds]

	Imports from—		Exports to—	
	1958	1959	1958	1959
U.S.S.R.	7.4	6.8	3.7	4.6
Poland	4.1	4.8	1.3	3.4
Czechoslovakia	1.2	1.2	.5	.3
Eastern Germany	.6	.7	.9	.4
Bulgaria	.2	.2		.2
Rumania	.5	.6	.5	.6
China	2.2	3.7	1.9	5.6
Total	16.3	18.1	9.0	15.3

Source: From Obroty W. Brytanii z krajami socjalistycznymi, in "Rynki Zagraniczne," Warsaw, Apr. 21, 1960.

Particularly problematic is the trade between Germany and the East bloc. In addition to the general difficulties, it involves problems dating from the Second World War. Germany, to be sure, has made many efforts to normalize these trade relations and to expand trade, especially with the U.S.S.R., Poland, and Czechoslovakia.

Trade between the German Federal Republic and the East bloc[1]

[In millions of dollars]

	Imports		Exports	
	1958	1959	1958	1959
East bloc, total	285.6	325.4	277.2	314.3
U.S.S.R.	92.0	105.4	72.1	91.0
Poland	70.9	81.0	78.8	70.0
Czechoslovakia	49.3	56.2	61.2	59.9

[1] Without Eastern Germany, China, North Korea, Mongolia, and North Vietnam.

Source: From Monatsberichte der Deutschen Bundesbank, December 1960.

Italy, Greece, and Austria also increased their trade with the East bloc. The biggest rise, however, was registered by Italy's imports from the U.S.S.R.

Italian imports from the U.S.S.R. rose from $39.7 million in 1958 to $78.48 million in 1959. In the cases of Italy, Australia, and Greece it is typical that imports from the East bloc considerably exceed their exports to it.

Trade between Italy, Austria, Greece, and the East bloc

[In millions of dollars]

	Imports		Exports	
	1958	1959	1958	1959
Italy	100.2	154.6	85.8	118.4
Austria	120.0	134.0	118.4	133.6
Greece	39.6	38.2	37.4	33.5

Source: From: Handel Grecji z Krajami socjalistycznymi, in "Rynki Zagraniczne," Warsaw, July 9, 1960; OEEC Foreign Trade, Overall Trade by Countries, October 1960; Nachrichten für den Aussenhandel, Frankfurt, March 14, 1960.

Two tendencies can be noted in the European trade with the East bloc: (1) trade keeps increasing, without yet amounting to a considerable part of the total OEEC foreign trade; (2) the East bloc has maintained a favorable balance of trade. While the trade surpluses of the various East bloc countries vary, it is clear that the striving for a favorable balance of trade has been successful so far.

EAST-WEST TRADE FROM JANUARY TO SEPTEMBER 1960

In the course of the past year, too, European East-West trade increased in some cases quite considerably. The East bloc states, to be sure, were unable to maintain their pursuit of a favorable balance with certain European countries.

It is particularly interesting to observe the type of goods principally involved in East-bloc trade. Generally speaking, the East bloc keeps offering and demanding the same kind of goods. Britain's imports from the U.S.S.R. are mostly timber (logs and boards), grains, hides, manganese ore, oil products and fish; about one-third of Britain's timber requirements are supplied by the U.S.S.R. In 1959 Soviet exports of timber (logs and boards) to Britain reached £27.9 million, and in the course of the first 9 months of 1960 they already came to £20.5 million.

During the first 9 months of 1960 Britain imported hides for £5.7 million (in 1959, £8 million), and wheat for £2.4 million (2 million tons), against £3.3 million (2.7 million tons) in 1959, from Soviet Russia. Britain's next biggest East bloc supplier is Poland. Poland's principal exports to Britain were meat (£15.3 million in 1959 and £11 million in the first 9 months of 1960); dairy products (£6 million in 1959 and £5.3 million in the first 9 months of 1960); timber (logs and boards) (£3.84 million in 1959 and £3.86 million in the first 9 months of 1960).

Britain's principal exports to the East bloc are machinery, ships, chemicals, iron, steel, and nonferrous metals. During the first 9 months of 1960 U.S.S.R. imports of machinery from Britain were valued at £15 million (against £10.5 million in 1959). About one-fourth of this was composed of textile machines. Poland imported machinery valued at £4.1 million in the first 9 months of 1960, against £5.7 million for the whole of 1959. On the other hand, British exports of copper declined (£5.5 million to the U.S.S.R. in 1959, but only £1.3 million in 1960). Exports of ships, by contrast, increased greatly. During the first 9 months of 1960 the value of ships exported from Britain to the U.S.S.R. came to £4.5 million, against £3.4 million for the whole of 1959. (From: Accounts relating to Trade and Navigation of the United Kingdom, September 1960.)

West German trade with the East bloc also increased considerably. The principal partners, beside the U.S.S.R. were Poland, Czechoslovakia, Hungary, and Rumania.

The principal West German exports to the East bloc countries in the first 9 months of 1960 were machinery (to Poland for $11.5 million, to the U.S.S.R. for $38.9 million, and to Czechoslovakia for $8.2 million); steel tubes valued at $24 million (84,000 tons) to the U.S.S.R.; iron and steel (ingots and rolled) valued at $10.3 million (65,000 tons) to Czechoslovakia; copper in different shapes to the U.S.S.R. for $16.9 million (75,500 tons), to Czechoslovakia for $3.7 million (52,704 tons) and to Hungary for $3 million.

French imports from the East-bloc nations were composed mainly of fuels, timber, meat, minerals, etc. The total value of fuels imported from the East bloc countries in the first 9 months of 1960 was $51.5 million (17.88 million tons). The principal suppliers were the U.S.S.R., Poland, and Rumania. The U.S.S.R. supplied coal and oil, Hungary coal only, and Rumania oil only. The value of timber supplied by the East bloc was $7.2 million. The principal suppliers were the U.S.S.R., Poland, Czechoslovakia, and Rumania. Larger quantities of meat were supplied only by the U.S.S.R. and Hungary. (From: Statistique mensuelle du commerce extérieur de la France, September 1960.)

France supplied mainly iron and steel, powerplants, chemicals, etc. The value of French exports to the East bloc of iron and steel was $75.78 million, and the value of powerplants more than $30 million.

Italy imported from the East bloc mainly fuel. It took 3.7 million tons of coal from the U.S.S R. and 5.7 million tons from Poland in the first 9 months of 1960, at a total value of $13.6 million. At the same time Italy imported from the U.S.S.R. 2.7 million tons of oil valued at $34.7 million. (From Statistica mensile del commercio con l'estero, September 1960.)

The principal goods imported by Sweden from the East bloc were fuels and foodstuffs. During the first 7 months of 1960 Sweden imported fuel from the U.S.S.R. and Poland to the value of $23 million, while imports of foodstuffs

amounted to $11 million. (From: Manadsstatistik över handeln, No. 8, 1960.) Iron ore was the principal Swedish export to the East bloc, valued at $13.5 million.

West German imports from East-bloc countries in the 1st 9 months of 1960

[In millions of dollars and thousands of tons]

	Wheat	Meat and eggs	Cotton	Coal	Oil and oil products	Manganese ore	Nonferrous metals
U.S.S.R.:							
Value	4.3		8.8	10.6		15.9	3.9
Tons	65		14	134.7		947	93
Poland: Value		15.5			4.2		
Czechoslovakia:							
Value				3.8	5.0		
Tons				48	769		
Rumania: Value						9.1	
Hungary:							
Value		10.9					
Heads		[1] 52,600					

[1] Livestock.

Source: From Der Aussenhandel der Bundesrepublik Deutschland, Teil 3 July–September 1960.

East-bloc trade with the Scandinavian and Benelux countries

[In millions of dollars]

	Scandinavia				Benelux			
	Imports		Exports		Imports		Exports	
	1958	1959	1958	1959	1958	1959	1958	1959
East-bloc total	379.9	445.4	380.7	413.9	170.1	228.1	194.6	184.7
U.S.S.R.		348.1		310.4	66.1	95.8	28.5	19.5
Poland		69.2		56.6	12.6	16.4	27.5	28.5

Source: Wrost obrotow Skandynawia z krajami socjalistycznymi, in: Rynki Zagraniczne, Warsaw, July 16, 1960, and Wymiana Beneluksu z krajami socjalistycznymi, in: Rynki Zagraniczne, Warsaw, May 24, 1960.

Trade between OEEC and East bloc countries in 1960

[In millions of dollars]

	January to September 1960		Monthly average in 3d quarter			
			1960		1959	
	Imports	Exports	Imports	Exports	Imports	Exports
Belgium-Luxembourg	52.7	77.7	6.4	7.4	6.9	4.5
France	111.3	162.3	12.7	16.6	10.2	12.6
German Federal Republic	274.2	280.9	34.4	30.4	26.5	26.9
Italy	197.8	129.9	21.9	13.4	12.1	10.6
Holland	70.6	42.6	8.7	5.2	10.5	4.5
Austria	125.1	107.7	13.6	12.0	10.3	10.7
Denmark	56.3	35.1	6.1	2.6	5.4	3.8
Greece	40.7	29.8	3.9	2.2	2.9	1.5
Iceland	14.0	13.2	1.5	0.8	1.9	1.3
Ireland	4.4	0.5	0.5	0.01	0.3	0.0
Norway	35.8	31.4	4.2	3.1	3.9	3.5
Portugal	4.6	6.0	0.7	0.8	0.1	0.4
Spain (January/July)	7.5	12.3			1.4	1.4
Sweden	84.2	76.8	9.3	9.6	7.8	8.1
Switzerland	33.4	42.3	3.8	4.6	3.1	4.5
Great Britain	269.5	212.9	35.9	27.0	34.3	16.8
Total	1,382.1	1,261.4	163.6	135.71	137.6	111.1

Source: From OEEC Foreign Trade, Overall Trade by Countries, December 1960.

The range of goods imported and exported by the smaller European countries—Denmark, Belgium, and the Netherlands—did not differ much from the pattern already mentioned. Belgium imported—in much smaller quantities, of course—grains, fuel, foodstuffs, and timber, mainly from the U.S.S.R., Poland, East Germany, and Czechoslovakia. Exports to the East bloc consisted mainly of iron and steel, electrical machinery, and copper. (From Bulletin mensuel du commerce extérieur de l'Union Belge-Luxembourg, September 1960.)

The Netherlands imported chiefly wheat, tanned leather, and fuels. In addition, China supplied them with rice, soybeans, and oilseed. The main articles of export were ships (to Poland), chemicals and drugs. (From Maandstatistik van de in-, uit- en doorvoer per Land, January to August 1960.)

Denmark's chief imports were foodstuffs, fuels, and timber. Danish exports to the Soviet bloc consisted mainly of machinery of different kinds, fish and dairy products. (From Vareomsaetningen med uitlandet, September 1960.)

LEADING PARTNER: THE U.S.S.R.

The outstanding partner in East-West trade is the U.S.S.R. While Soviet trade with non-Communist European countries accounts for only a fraction of total Soviet trade—75 percent of it being with the East bloc countries—trade with non-Communist Europe follows immediately after.

In 1958 Soviet imports totaled 17.39 billion rubles; the share of non-Communist European countries amounted to 2.36 billion rubles. Total imports rose to 20.29 billion rubles in 1959, and the share of European countries to 2.87 billion rubles. In 1958 Soviet exports were somewhat smaller than imports, amounting to 17.19 billion rubles; exports to non-Communist European countries amounted to 2.6 billion rubles. Exports rose in 1959 to 21.76 billion rubles, and Europe's share to 3.29 billion rubles.

The principal Soviet exports were coal, crude oil and oil products, logs and sawn timber, and wheat. Out of a total of 11.1 million tons of coal 3 million tons, valued at 195.4 million rubles, went to the OEEC countries, while out of a total of 24.8 million tons of oil and oil products in 1959, 10.29 million tons, valued at 657.9 million rubles, went to Europe. Out of a total of 5.9 million tons of wheat in 1959, 1.15 million tons, valued at 290.5 million rubles, were exported to OEEC countries. Since these figures are taken from official Soviet statistics which state the value of imports and exports in rubles, they are quoted here in the same currency. Although the official rate of exchange, prior to January 1, 1960, was 4 rubles to $1, it is not advisable to convert Soviet figures into other currencies.

U.S.S.R. trade with the OEEC countries

[In millions of rubles]

	Imports from—		Exports to—	
	1958	1959	1958	1959
Austria	253.8	326.9	88.6	159.3
Great Britain	291.5	363.4	582.2	662.7
Belgium	64.8	38.8	92.1	109.0
Holland	70.8	52.4	227.9	266.8
Greece	67.6	49.2	56.1	63.9
Denmark	57.0	52.9	56.2	106.5
Iceland	44.0	49.5	49.5	47.9
Spain	19.9	20.1	22.4	11.5
Italy	141.1	211.1	154.2	311.9
Norway	64.8	68.9	68.5	70.8
Portugal	7.5	7.1	3.4	5.2
German Federal Republic	288.3	408.4	262.5	367.1
Finland	548.8	568.5	468.6	578.1
France	322.3	402.0	348.4	351.0
Switzerland	14.0	18.8	12.1	17.9
Sweden	112.3	166.5	120.8	177.4
Total	2,368.5	2,876.5	2,613.5	3,297.0

Source: From Vneshnyaya torgovlya U.S.S.R. za 1959 god, Vneshtorgizdat, Moscow, 1960.

No official Soviet figures are available at this time of writing regarding the trade between U.S.S.R. and the OEEC countries in 1960. They can, however, be gathered from the statistics published by the OEEC countries.

During the first 6 months of 1960 U.S.S.R. exports to Italy were valued at $52.3 million, U.S.S.R. imports from Italy at $37.5 million. During the same period Soviet exports to Austria amounted to $16 million, and imports from Austria to $18.7 million.

In comparing the development of Soviet trade with the OEEC countries and overall East-West trade in Europe, one is struck by the growth of the Soviets' share. Not only have the Soviet foreign trade practices set the pattern for the entire East bloc, but the Russians have apparently succeeded in getting hold of most of the other East bloc countries' trade with the West.

Trade between the U.S.S.R. and some European countries, January to September 1960

[In millions of dollars]

	Exports		Imports	
	1960	1959	1960	1959
German Federal Republic	135.6	119.2	84.0	54.9
Sweden	67.2		85.9	
Denmark	100.3	74.8	109.2	44.3
Holland	33.65	28.8	19.09	19.59
Great Britain	22.8	17.28	11.08	6.48
France	27.8		4.7	

Source: From accounts relating to trade and navigation of the United Kingdom, September 1960; Monatsberichte der Deutschen Bundesbank, October 1960; Statistique mensuelle du commerce extérieure de la France, September 1960; Mandatsstatistik över handeln, No. 8, 1960; Vareomsaetningen med utlandet, September 1960; Maandstatistiek van de in-, uit- en doorvoer per Land, January August 1960.

Mr. SOURWINE. I show you an article from the same publication May 1961 entitled "On Trading With the Communist East." Is that in the same category?

Mr. GWYER. Yes; it is, and in my opinion, the estimate of the situation, if you will pardon my military parlance, it is extremely good and perceptive in the sense that the author perfectly well understands the basic motivations guiding the Soviets in trying to stimulate and expand trade with the West. There is one specific passage here, and it is very brief, Mr. Chairman, I would like to introduce for the record, and this is in reference to long-term trade agreements between the Soviet Union and the countries they enter into the agreement with, and I quote:

Long-term economic ties and diplomatic immunity, moreover, provide them—

this means Soviets commercial attachés—

with excellent opportunities for the economic espionage and for the establishment of Western business and industrial interests that are in sympathy with them.

Every Western businessman entering into trade relations with the Communist East must realize that he is not making contact with a market in the Western sense of the term; the Communist market is not based on consumer demands, but on the arbitrary political decisions of the Soviet foreign trade authorities.

Mr. SOURWINE. You suggest that this article also should be in the record?

Mr. GWYER. In its entirety, sir.

Mr. SOURWINE. You consider it reliable and authentic?

Mr. GWYER. Yes; I do.

Mr. SOURWINE. May it be received, Mr. Chairman?

Senator KEATING. It is received.

(The document referred to was marked "Exhibit No. 17" and reads as follows:)

EXHIBIT No. 17

[From the Swiss Review of World Affairs, May 1961]

ON TRADING WITH THE COMMUNIST EAST

(By Willy Linder)

Parallel with a series of articles reporting the facts and figures of East-West trade, the Neue Zürcher Zeitung has recently published some critical comment on this issue, of which the following, by a member of its financial editorial staff, is an example.

No one at all familiar with the history of the Soviets and with the writings and declarations of their rulers can be ignorant of the fact that the cold war is being waged not only by political, but also by economic means. Stalin, it will be remembered, wanted foreign trade to serve political aims. This principle continues to be applied, though of course Communist tactics in economic policy have changed considerably with the dramatic emergence of the Soviet Union on the world-political stage. No propagandistic smoke screen can hide the political aspect of Soviet foreign trade. The signs revealing that the old Stalinist motivation continues to apply in economic relations with the capitalist countries are too evident not to be seen. One example among many was Khrushchev's declaration at the 28th Party Congress that "from the fact that we advocate peaceful coexistence and peaceful competition with capitalism one should under no circumstances conclude that the struggle against the bourgeois ideology and against the remnants of capitalism will be relaxed by our people; our task consists in a continuous attack on the bourgeois ideology and the unmasking of its antisocial and reactionary character."

Despite the transparency of Soviet intentions, the use of seductive slogans, trying to persuade the West to expand its trade with the Communist empire, seems to have considerable success. The tendency to make a distinction between trade and political relations with the Communist East can be observed at work in the free world, and often even influential organizations appear only too ready to put the counterfeit currency into circulation. The movements going by the concept of "neutral economic contacts" are no rarity any longer; Great Britain is particularly active in this direction. Such conduct would seem to reveal a considerable measure of political naiveté, and a readiness to forget the lessons of history.

In every planned economy foreign trade is bound to become a neuralgic point, for it is here that the planning system comes up against systems organized along different lines. Here the economic planners must fear that disturbing elements will enter their system from the outside, and find themselves confronted with the problem of how to make it secure against such disturbance. The means by which this problem has been solved in the Soviet Union is the government monopoly in foreign trade, which was introduced at the end of the twenties and has stayed in effect ever since. It involves a measure of protectionism that far exceeds what could have been achieved with an ordinary protective tariff system, which was also discussed in the Soviet Union. The government monopoly in foreign trade in fact is an inevitable consequence of the planned economy which has to operate according to the intentions of the controlling authorities.

During Stalin's era Soviet trade was characterized by the restriction of importation to producer goods, in order—to quote the dictator—"to obtain the necessary technological equipment even before the victory of the proletarian revolution is achieved in one or several of the capitalist countries." Another characteristic was the pursuit of autarchical aims. Apart from the fact that the political aim of autarchy corresponds to the principle of central planning, the Soviets obviously feared that they might become too dependent economically on the capitalist countries. It is hardly surprising under these circumstances that in the thirties Soviet foreign trade dropped below the modest level that prevailed in Tsarist Russia.

In the postwar period the defensive Stalinist formula; that is, the aim of preventing the Soviets from becoming economically dependent on capitalist countries, has been given an offensive twist insofar as an effort has been made

to attach economically weaker countries to the Soviet economy. In the course of such efforts considerable political capital may be invested when circumstances demand, as in the cases of Iceland, Finland, and Yugoslavia.

In a truly virtuoso manner this pattern has been applied in building up the Eastern Communist market properly speaking, that is in the economic integration of the satellite nations within the Comecon. (Compare Swiss Review of World Affairs, March and April 1961.) It has long ceased to be a secret that the economic dependence of the satellites is being deliberately developed for political purposes. The sovietization of, that is, the systematic withdrawal of freedom from, these countries has already progressed very far and it is clear that the Soviets intend to assure the unity of the East by means of this enslavement.

From this point of view the argument that Soviet concentration on intra-East-bloc trade has been encouraged by the embargo imposed by the United States and the NATO powers on goods of strategic importance, appears greatly weakened. Although the embargo hit the Soviet Union at a vulnerable spot, its impact should not be overestimated. For to the extent to which the West sends strategically nonimportant goods to the East, the Soviets are put in a position to transfer productive power to their industrial centers of gravitation. As a result of the imperfect mobility of the factors of production, however, the effect of the embargo is only partially compensated. For this reason there can be no doubt that by means of a forced propagation of East-West trade the Soviets would like to ultimately break down the embargo or at least weaken its effect.

By its very nature Soviet planned foreign trade must observe the official planning periods. This explains the Soviets' tendency to seek long-term trade agreements, to combine the trade agreements with consular arrangements, and to demand diplomatic immunity for the members of their trade missions. It is clear that such long-term economic agreements with the East bloc can considerably reduce the West's freedom of movement, since they make short-term adjustments to changing conditions difficult or impossible. In addition, the Soviets' fidelity to agreements is always a doubtful matter. They do not hesitate to break agreements for the sake of some tactical advantage. Long-term economic ties and diplomatic immunity, moreover, provide them with excellent oportunities for economic espionage and for the establishment of contact with Western business and industrial interests that are in sympathy with them. Every Western businessman entering into trade relations with the Communist East must realize that he is not making contact with a market in the western sense of the term; the Communist market is not based on consumer demand, but on the arbitrary political decisions of the Soviet foreign trade authorities.

The sporadic demand that can be observed arising in some of these Communist markets is a result of the imperfect functioning of the planned economy. Paradoxically, the safety valve for the correction of either an excess or a lack of pressure in the planned economy is trade with the capitalist nations. It can thus be said that the free world, which entrusts its individual enterpreneurs with a large measure of economic responsibility, helps to keep the mechanism of the Communist economy functioning. That sporadic demand, moreover, can be a result of an effort to level out the development of the various branches of the planned Soviet economy, which in fact is characterized by striking discrepancies. One way to even out these discrepancies and in general to reduce the lag behind the West is to purchase highly qualified industrial goods in the West. Thus the free world supports the Soviets in their efforts to raise their economy to Western levels without having to make a corresponding productive effort of their own and without exposing themselves to competition. In this connection numerous Western enterprises appear most eager to supply the Soviets with highly qualified goods while losing potential markets in the developing countries.

A further unfortunate aspect of East-West trade consists in the fact that a market situation in which a monopolistic (Soviet) demand meets with a diversified (Western) supply always leads to more advantageous prices for the former. By continuing to compete for orders from the East, the West actually helps the East to realize its political aims—at low prices! That the Soviet Union does not make use of this opportunity even more frequently is not due so much to the reserve of Western entrepreneurs as to the fact that the industrialized countries have for some years now been absorbed in their own economic expansion. By developing its trade with the free world the Soviet Union is of course not primarily interested in an improvement of the situation of the Russian consumers. The planned economy can hope to function fairly well only on the condition that

it accepts chronic shortages—only then can it expect to have an adequate outlet for its production, which is not regulated by the needs of the people. For this reason the Soviets must repudiate the system providing for a diversified supply of consumer goods.

The fact that by an uncontrolled and unconditional trade with the Communist East and the free entrepreneurs of the West support the economic foundations of the very regime that constitutes the greatest danger to them should at least persuade them to establish a concerted policy. An international organization such as the OECD could assume the task of coordinating Western policy in trading with the East. Such a procedure could correct the impression that certain interests in the West do not seem to realize the threat of Soviet totalitarianism, and do not properly appreciate the nature and importance to them of political freedom and its institutions. It would make clear that there is no "neutral" trade with the East.

Senator KEATING. Thank you very much, Mr. Gwyer. That will conclude your testimony.

Tomorrow, we will hear from witnesses of the Defense, Commerce, and State Departments. I cannot give the names of them, because we have asked for those to appear who can furnish specific information with regard to shipments, and it is probable that there will be more than one representative of each of these departments. They will appear tomorrow morning and the hearing is now adjourned until 10:30 tomorrow morning.

(Whereupon, at 3:30 p.m. the hearing was adjourned until 10:30 a.m., Tuesday, October 24, 1961.)

APPENDIX I

EXHIBIT No. 6

[Translation—Russian]

("Mekhanizatsiya i avtomatizatsiya proizvodstva," No. 5, May 1961, pp. 48–51)

HIGH RELIABILITY AND DURABILITY OF MACHINERY AND INSTRUMENTS IS A MATTER OF PARAMOUNT IMPORTANCE

The plenary session of the Technical and Economic Council of the State Committee on Automation in Machine Manufacturing with the Council of U.S.S.R.'s Ministers, held in February, was devoted to problems associated with the increase in reliability and service life of machines and instruments.

The plenary session was opened by P. N. Goremykin, Deputy Chairman of the Technical-Economic Council.

V. T. Nezhdanov (All-Union Scientific Research Institute of Electromechanics) spoke on the causes of inadequate reliability of currently manufactured low-voltage equipment. For instance, the series A–2000 automatic equipment has a low carrying capacity, contacts get overheated, contact points become fused: e.g., the Ul'yanovskiy Plant has developed new types of automatic equipment with a longer service life. Cartridges used to burst in series PR–1 fuses, and now this series is being replaced by improved PR–2 series. Contacts burn out in the knife switches manufactured by the Ufimskiy Plant. Direct current contactors operate unsatisfactorily, and a new KPV–600 series has been developed in which a number of deficiencies of earlier contactors were eliminated. Nezhdanov expressed an opinion that one of the causes of this low reliability can be attributed to the insufficient volume of testing of products; it often happens that the materials used do not correspond to requirements expected from equipment.

B. I. Kuznetsov, chief designer of electrical machinery at the Khar'kovskiy Electromechanical Plant, pointed out that in the field of machine building the work of classifying and studying the causes of unreliable operation and of exploring ways for improving reliability is not carried out in a satisfactory way. An average of about 20 percent of all machinery installed is subject to general overhaul every year. Small capacity electrical machines account for a large percentage of damages.

The overwhelming majority of damages is accounted for by stator and armature windings. One of the causes of a premature breakdown of machines is their

improper operation. The quality of manufactured electrical machines is not always at the proper level. For instance, at the electric power stations of the Soyuzglavenergo, 37 percent of damages to generators and 25 percent of damages to electric motors were caused by manufacturing defects.

A frequent cause of machinery breakdown is the excessive heating of insulation; it is necessary to use insulating materials with a greater resistance to heat. Besides the protected structure, a closed air-ventilated structure is being provided in the development of new series of electric machines, both intended to improve their operation; use is being made of heat-resistant wires, varnishes, etc.

A. I. Sprishevskiy, Director of the All-Union Scientific Research Institute of the Bearing Industry, discussed measures taken to increase the reliability of bearings. The Institute develops new methods of calculating and designing methods (for high frequencies in particular) which will increase the reliability of bearings; the design of bearings is being modernized in order to improve contact stresses along the width of raceways. The Institute is also conducting work to develop new designs of highly reliable bearings. The introduction of automated lines, which would include automatic transfer and inspection; sorting, lubricating, and packing operations are of tremendous importance. Wider use should be made of heat-resistant steels.

Doctor of Technical Sciences D. N. Reshetov (Experimental Scientific-Research Institute of Metal-Cutting Machine Tools) reported the work being done to increase the reliability of machine tools. The yearly expenditure for restoring the productive capacity of existing machine tool stocks is higher than the wholesale value of new machine tools manufactured during the same year. The cost of a general overhaul on the average amounts to 35 to 70 percent of the cost of machine tools, while the labor input it requires is higher than the labor input required for the manufacture of new machine tools. A total of one-third of all Soviet machine tools are employed in repair operations.

The following are the main causes of breakdowns: tearing away the workpiece from the chuck or fixture; tool breakage; collision of moving parts with each other or with stationary parts; gear shifting at high speed; removal of chucks from spindles having threaded ends (stripping of threads); accidental engaging of a cutting tool into the work piece with the presence of a considerable backlash in the feed screw; breakdown of elements of automatic electrical and hydraulic systems. The machine tools should be equipped with power indicators; chucks and mechanized clamping should be improved; wider use should be made of travel limiting stops; standards for an optimum shape of tooth-roundness and system of gear shifting at slow speed should be introduced.

Wear is the basic factor which determines the durability and, consequently, also the reliability of machine tools. Among the driving gears, crowns of teeth shifting gears are subjected to greatest wear. A barrel-shaped rounding of crowns increases durability, two or threefold.

Open "friction assemblies" (otkrytye uzly treniya) should be eliminated; use should be made of hardened guides, running screws, and lubrication should be improved. In order to increase the resistance to wear, various materials should be used—e.g., friction pairs and metal-plastic.

Increased reliability of lubrication may be attained by the use of forced lubrication with a volumetric control or blocking which would stop the function of a machine because of lack of lubricant.

The reliability of transfer machines is characterized by the frequency of breakdowns and the duration of the time lost in restoring the workability of tools and fixtures; electric, hydraulic, and pneumatic equipment; loading, transfer, and clamping devices; and other machine tool mechanisms.

The observed breakdowns (otkazy v rabote) of hydraulic drives are caused by wear of valves, wear of control elements, upsetting of controls (because of inadequate fixation, low quality of springs, etc.) and also because of the breakdown of electrical equipment. In modern automated machine tools the requirements for the reliability of electrical equipment, and especially electrical apparatus, are continuously increasing. At the present time, the percentage of breakdowns in automatic machine tools and transfer machines caused by breakdowns of electrical equipment is considerable and must be drastically reduced.

The majority of malfunctions is related to the operation of relay-contact apparatus.

It is essential to take the following measures: increase the service life of equipment; design series of electrical equipment having common reliability, dimension, and methods of assembly requirement; standardization of two categories of electrical control equipment according to its durability, areas of application, etc.; introduction of contactless equipment without moving parts.

A reliability index for machine tools should be included among the more important factory indices. It is essential that the manufacturing plant be responsible for the average service life of manufactured tools and interested in using assemblies and equipment that would assure a realistic increase in the service life of machines.

V. I. Roshchupkin, Deputy Director of the State Design and Scientific Research Institute for Petroleum Machinery, reported on endeavors to improve petroleum machinery. Mechanization of labor consuming drilling, extraction and refining processes and transition to automation of these processes depend to a large degree on the reliability of machinery, mechanisms, equipment, and installations. The experience of his Institute demonstrates that sometimes even well engineered machines and mechanisms do not show a degree of reliability of all the elements of the system which would expedite their automation.

Frequently, the low quality of materials has a negative effect on the durability of products.

The use of general purpose electrical equipment in drilling installations results in a sharp drop in reliability. In many cases the service life of machines is shortened owing to a lack of match between electrical equipment and operating conditions. It is necessary to manufacture special electrical equipment for certain types of machines and installations.

The reliability of manufactured machinery could be greater if institutes and manufacturing plants had greater possibilities of testing individual assemblies and machines. The difficulty of finishing large new equipment under laboratory or plant conditions is a specific trait of the machine-manufacturing petroleum industry.

It is necessary to carry out the final finishing under industrial (field) conditions.

The Institute is conducting experimental investigations oriented at a maximum improvement of the reliability and durability of petroleum equipment.

A. D. Gridin, Chief Engineer of the State Experimental Institute of Design and Construction for the Coal-Machinery Industry, said: "Owing to the multiplicity of links in the consecutive chain of equipment operating in coal mines, an insufficient reliability of individual machines brings about a considerable decrease of the time of useful work. Downtime of coal combines due to breakdowns and shutdowns of the conveyor operation amount to 20 to 25 minutes per shift."

In order to improve the reliability and durability of mining machines it is necessary to study their loading conditions to analyze the breakdowns and shutdowns occurring during their operation; to design mining machines making maximum use of already developed standardized assemblies; to make wide use of hydraulic drives; . . . etc.

The technological equipment used in the textile industry of the U.S.S.R. is not sufficiently reliable—said V. A. Shalashov (VNIILtekmash). Downtime caused by during-shift repairs, . . . result in a low coefficient of equipment utilization.

One of the causes of low reliability of textile equipment is the fact that the precision and resistance to wear of assemblies and parts anticipated in the design is not being observed by the manufacturer.

The fact that textile equipment is very poorly equipped with automatic control devices and instruments represents another important cause of its low reliability.

The automatic control systems used in worldwide practice are usually either specially designed for or are adapted to the control of technological processes employed by the textile industry. Soviet electrical engineering and instrument-making industries do not manufacture them.

One of the causes of unreliability is the low quality of the so-called auxiliary materials (shuttles, etc.) which are an inherent part of textile machinery . . . . In worldwide practice shuttles are made of hard wood, while in the U.S.S.R. they are made of beech; as a result a shuttle serves for 1,000 instead of 2,000 hours. Auxiliary materials are being manufactured without taking into account increased speeds for which modern equipment is calculated.

S. I. Akopyan, Director of the Automobile and Tractor Scientific Research Institute, told of the attempts to improve the reliability of tractors. Main causes of inadequate reliability of tractors are low resistance to wear and insufficient

strength. Low quality of products (electrical equipment, rubber, lubricants, and fuels) reduces the reliability and durability of tractors and accelerates their wear. Also inadequate servicing impairs the reliability and operation of tractors. Thus, the wear and tear of D–54 tractors is on the average two- or threefold higher with the majority of the users than with those who observe basic rules of servicing.

There is an inadequate inspection of design and manufacturing technology of new model tractors before their release for lot production. Plant tests are usually conducted on an inadequate scale, accelerated stand testing is practiced on a very limited basis, and forced operational testing is not employed at all. It is necessary in nearest future to introduce into tractor manufacturing the most wear-resistant coatings and platings which as of now are not being used at all.

Academician A. I. Berg submitted a report which points out that one of the chief indices of reliability of most machines is the full use of their capacity at a minimum outlay for repairs. In electrical, water, gas, and heat supply systems and in refrigeration, the key factor of reliability is the continuity of supply of the above agents.

In electric power systems the use of automatic protection and control, as well as of telecontrol, telesignal, and telemetric devices, which at the Moscow Regional Power System Administration operate with a utilization factor of 96–99 percent, is inadmissibly delayed. Complex automation and telemechanization of electric power systems, which present sure means of improving the reliability of the electric power base of the country, are still developing very slowly.

In metallurgy the reliability of the basic operating units depends mainly on the reliability of support equipment. Thus, interruptions in operations of charging devices frequently hinder the normal operation of blast furnaces. (Enumeration of specific cases of breakdowns.)

In blast and open hearth furnace shops—control, measuring, and regulating devices frequently break down owing to large quantities of dust and aggressive gases in the air and sharp temperature variations. (Enumeration . . . .)

Automation, which is the best guarantee of safety and of the high product quality, is being introduced but slowly in the chemical industry. The absence of a continuous and reliable automatic control of raw materials frequently upsets the optimum conditions of equipment operation. Universal pneumatic regulators break down early under the effect of aggressive environment (medium). Breakdowns occur in servomechanisms owing to insufficient protection against corrosion or gumming.

In chemical processes a breakdown of one piece of equipment in a production flow causes a violation of the technological process along the entire line and also causes defectives which contribute to heavy losses. For instance a breakdown of one of the links in an equipment complex for the manufacture of a viscose fiber only in one day causes losses amounting to five percent of the value of the unit. (Enumeration. . . .)

Inadequate reliability of many agricultural machines is often one of the causes of an overextended timetable for both planting and harvesting. The reliability of self-propelled agricultural and other machines equipped with internal combustion engines depends to a large degree on the performance of engines. Thus, the formation of cracks in cylinder blocks, caps, and sleeves, and breakage of connecting rods and crankshafts in diesel engines result in the standstill of numerous machines and considerably increase the cost of their operation.

In the machine manufacturing the reliability of operation of equipment not only predetermines the high quality of products, but is also a prerequisite for the effectiveness of its overall automation. The reliability of equipment operation and of manufactured machines depends to a large extent on the quality of basic materials supplied to machine manufacturing plants. The automation equipment is especially sensitive to the deviation of their indices from the rated values. (Enumeration . . ..)

The overwhelming majority of manufacturing equipment mechanisms is set into motion by induction motors of 0.6 to 100 kilowatts; there are over 12 million of these units in the U.S.S.R. with a total capacity of 70 million kilowatts. They consume 40 percent of the total electric power generated in the country. However, their service life is not long. More than 20 percent have to undergo a general overhaul after 3 to 4 years. About 90 percent of the motors break down as a result of damage to windings traced to improper winding operations and the poor quality of insulation compositions with which they are impregnated, insufficient protection against breakdown conditions, mismatch between the

type of the motor and the conditions of its use, and other reasons. As a consequence, whole shops for rewinding of motors employed by mining transportation equipment have been set up at numerous mining enterprises.

Numerous defects in electric drive operation cause a premature wear of switching equipment. The guaranteed mechanical resistance to wear of Soviet a.c. contractors lies within the limits of 5 to 10 million cycles instead of the 20 million of some foreign-made contactors. Actually, the average number of cycles is about 20 percent of that guaranteed. The basic cause of premature breakdown in contractor operation is traced to deficient manufacture. (Enumeration . . ..)

Increased reliability of elements, components, and whole units of engineering equipment still does not solve the problem of reliability of a whole unit, united by a single system of automatic control. The use of little-sensitive, inert, or unstable pickups does not provide true information on the status and changes of controlled parameters.

Lack of stability of mechanical, heat-resistant, chemical, or radiation properties of the medium quickly leads to a breakdown of memory units of pickups. Unreliability of many pickups is one of the basic reasons for breakdowns in the functioning of automatic control systems.

Other frequent cause of breakdowns in automatic control systems is accounted by unreliable contact devices installed in potentiometers, relays, commutators, and shot-off equipment.

Not enough attention is paid to the problem of reliability despite huge losses incurred by the national economy as a result of breakdowns and downtime of industrial equipment.

In a number of organizations we already have ways and means for centralized followup of individual factors contributing to the unreliability of technical equipment. Thus, the State Committee on Radioelectronics of the Council of Ministers U.S.S.R. has more than 130 laboratories at industrial enterprises investigating and improving elements of radioelectronic equipment according to one single plan. The Moscow Regional Power System Administration has a central inspection service for breakdowns, which registers and investigates all cases of breakdowns in the Moscow United Power System, while the inspection service of the Main Power Administration of the Gosplan U.S.S.R. generalizes and analyzes the data on breakdowns of power systems on a statewide scale. Evidently, this practice could be extended to other branches of the national economy.

Theoretical and experimental investigation of all indices of reliability should be substantially expanded. The scarcity of nomenclature of scientific instruments having a high degree of precision lowers the quality of experimental investigations and renders doubtful the authenticity of results obtained. In order to ensure the reliability of newly developed devices it is essential to equip laboratories with modern instrumentation. Scientific instrument manufacturing is far from satisfying the requirements of national economy or the needs of science.

One of the most frequent causes of unreliable function of machines is the difference in the service life of its individual units, assemblies, and parts, as a result of which the downtime of machines often exceeds the length of operation. The sums of money lost for repair in some cases exceed ten times the cost of machines. For instance 30 percent of tractors, up to 60 percent of automobiles, up to 25 percent of construction machinery are systematically idle. Diesels installed on dump trucks manufactured by the Minsk Plant with a load capacity of 25 tons work only 1,000 to 1,200 hours, that is three to four months, prior to a general overhaul; electric motors or vibrators function 200 to 300 hours; lubricating pumps used in hydraulic drives of machines have a service life of 800 to 1,000 hours; many assemblies of agricultural machinery do not last a single season. There is a need for a method of calculating designs for optimum service life with an economic justification of the length of service of individual parts and assemblies which undergo a maximum wear, as well as the design involved, taking into consideration the obsolescence of equipment.

Plants should have at their disposal good experimental shops with fully modern and constantly modernized equipment which would permit to inspect and make more precise the technology of manufacture with the idea that it would be possible to install on manufactured equipment the latest achievements and in such a way facilitate the preparation for a lot and mass production.

During the plenary session a report was delivered by the Chairman of the State Committee for Automation and Machine Manufacturing with the Council of Ministers of the U.S.S.R., A. I. Kostousov.

In a resolution accepted by the plenary session, basic measures were outlined for the increase of reliability of machines, equipment, and instruments. In particular, the need was pointed out for a search for new methods which would contribute to a drastic improvement of reliability. To this end the Institutes should intensify the respective scientific investigations and develop the following theories on: the reliability of technical devices, the calculation of the reliability of complex multielement systems, the forecast of failures, and the automatic provision of reserve power. They should work out and ratify a single terminology for reliability, and make researches for new materials and semiproducts which, owing to their physical and chemical properties, would suit the conditions under which the manufactured machines, apparatus, and instruments would be used. They should study the nonstationary processes in systems and the dynamics of machines, equipment, and instruments in order to ascertain the reliability of their operation under transient conditions. It was found necessary to organize at the Scientific Research Institutes of the State Committee on Automation and Machine Building laboratories to study reliability and to work out a method that would predetermine on a scientific basis the economically sound service life of equipment and technical products, taking into account their physical wear, repair costs, and obsolescence. On the basis of these methods it will be possible to work out the indices of maximum durability.

When working out and comparing specifications it will be necessary to include in them the characteristics of operational conditions, standards of reliability, and of optimum service life and methods of reliability inspection. Calculation and experimental materials characterizing the reliability provided for in the design should figure in technical projects. A systematic study of operational conditions of machines, equipment, and instruments should be organized with the participation of designers. A regular modernization of designs with substitution of elements and assemblies having a lowering effect on reliability should be carried out. Methods of accelerated testing of materials and designs and the technical means required for this purpose should be worked out on the basis of modern techniques.

It is necessary to introduce a progressive technology providing for a higher reliability of manufactured goods; to develop specialization and cooperation in the production of standardized parts and assemblies, and also of completing parts; to organize effective control of the conditions of material and semifabricated items coming to a plant; to introduce means of continuous control (inspection) on machine units which automatically would assure the required tolerances during the machining processes; to apply widely self-adjusting systems of automatic control and of optimizing control machines; to conduct accelerated testing of manufactured machines, equipment, and instruments. It is necessary to organize an accurate and consolidated system for collection of statistical data on the operation of machines, equipment, and instruments, and also a qualified processing of these data and an analysis of subsequent information on obtained results for the scientific research, design, and industrial organization; to increase the quality of employed materials and in the first place the quality of lubricants; and completely revamp and improve the organization of repair.

APPENDIX II

EXHIBIT No. 7

SOVIET METAL-CUTTING MACHINE TOOLS: ASSERTIONS AND FACTS [1]

(By Joseph A. Gwyer, Library of Congress, Washington, D.C.)

Recent scientific developments in the Soviet Union, culminating with the launching of the Sputnik, have reawakened the interest of the American people in the technological and industrial progress of that country. During the past four years, numerous studies and reports have been written on the various aspects of the industrial and technological race between the United States and the Soviet Union. Unfortunately only few were on the subject of metal-cutting

[1] NOTE.—The subsequent discussion is limited to metal-cutting machine tools only. The Russian definition of functions of metal-cutting machine tools (metallorezhushchiye stanki) is the name given to any machine of that class, which taken as a group, can build other machines and includes such as lathes, drilling machines, borers, grinders, etc.

machine tools, which are of central importance to the achievement of an industrial capability. American machine tool engineers are particularly interested in the growth of and developmental trends in the Soviet metal-cutting machine tool industry. The latter, if judged by statistics alone, manufactures large quantities of metal-cutting machine tools. Some of the reports on this subject assert that the Soviet machine tool industry has assumed a quantitative lead over the machine tool industries of the United States and other Free World countries, that Soviet metal-cutting machine tools are relatively modern, and that some units are produced three to four times more efficiently.

A survey of unclassified Soviet technical literature does not *support the above assertions.* Quite the contrary, it shows that the Soviet industry specializing in the production of metal-cutting machine tools lags behind the United States in terms of output of physical units and is at least 15 to 20 years behind the United States in machine tool technology. The past and current Soviet emphasis on quantity rather than quality of machine tools exerts a detrimental effect on the production of modern equipment. Plant managers and employees alike are reluctant to retool for new models. This is especially true when it means a protracted downtime foregoing lucrative premiums for reaching and surpassing assigned quotas with obsolete World War II models. In 1956, from 92 to 96 percent of Soviet industrial-type metal-cutting machine tools programmed for production in lots greater than 10 units by the 48 plants of the former Ministry for Machine Tool and Tool Industry were of World War II design. Although the Soviets have made some progress since 1956, their situation as of this moment is unsatisfactory. This may explain the Soviet drive to dump on the markets of underdeveloped countries of the world the relatively inefficient and obsolete machine tools manufactured at home at a constantly increasing scale, and the paradoxical desire (in view of their boasted technological supremacy) to acquire Western European and America's most advanced metal-cutting machine tools. This can be only because the latter have built into them the technical and engineering knowledge the Soviets are not in a position to duplicate.

According to Soviet reports, the fulfillment of production goals as set by the Seven-Year Plan (1959–65), will depend on how successful is the Soviet machine tool industry in solving the problem of producing technologically modern and complex equipment suitable for automation. Soviet progress in this respect has been very slow, suggesting that the fulfillment of goals is in great danger, hence such great interest of the "Stankoimport" in Western machine tool technology.

Perhaps most characteristic of the existing situation is the statement by the Director of ENIMS, A. P. Vladzievskiy, who, on 21 March 1961, before the gathering of Moscow's scientists, stated that "* * * the personnel of the institute together with workers of machine tool manufacturing establishments pledged themselves to produce precision automatic machine tools, which until now had to be procured from abroad, particularly from the U.S. We have fully resolved, said the speaker, to overcome the lag in this important area * * *"[2]

Comparisons of efficiencies in manufacturing machine tools here and in the U.S.S.R. are of questionable value since it would be erroneous to equate man-hour requirements for a modern, 1961 model jig borer or grinder manufactured in this country with a World War II model jig borer or grinder manufactured in the Soviet Union today. The Soviets themselves report that the labor productivity in their industry specializing in the manufacture of metal-cutting machine tools is only 53.7 percent of that of the U.S. machine tool industry. Furthermore their calculations assume that their currently manufactured machine tools are on approximately the same technological level, an assumption quite absurd in view of available data. Perhaps the best proof of Soviet inefficiency can be found in the case of the much-talked-about 1K62 lathe manufactured by "Krasnyy proletariy." Only by introducing mass-production methods has the Soviet industry reportedly decreased the man-hour requirements to produce this relatively simple machine to a level about 20 percent below that required for similar equipment manufactured only on a small lot basis in the United States.

[2] "Sobraniye uchenykh Moskvy," in Ekonomicheskaya gazeta, 22 March 1961, p. 1.

The above conclusions are based on a review of data which is readily available to anyone willing to scan the vast holdings of Soviet technical journals and monographs in the Library of Congress. The subsequent discussion, which, for obvious reasons is fully documented, covers (1) the overall volume of metal-cutting machine tools manufactured in the Soviet Union and the volume of industrial-type metal-cutting machine tools[3] manufactured in 1956, (2) the obsolescence of industrial-type metal-cutting machine tools, (3) degree of concentration, (4) production of transfer machines, and (5) productivity.

VOLUME AND OBSOLESCENCE

The assertion that the Soviets are outproducing the United States machine tool industry, at least in units, may be dismissed by simply referring to the Facts for Industry, a U.S. Bureau of Census publication. For the years 1956, 1957, 1958, and 1959, this publication gives the United States industry credit for manufacturing more or almost as many metal-cutting machine tool units as the Soviet reportedly manufactured during the same period.

In comparing the output of their machine tool industry with that of the United States, the Soviets use Bureau of Census figures for the simple reason that their totals for various years include both light and heavy metal-cutting machine tools. Soviet figures give man-hour requirements per industrial-type machines (excluding casting and forging operations) ranging from 50 to 137,000 man-hours.[4] A definite indication as to the size and complexity of some of their industrial-type machine tools may be found in their 1956 production program, which shows that only 122 models were produced in 48 plants entering the former Ministry for Machine Tool and Tool Industry on a 10-units-or-more lot basis, the lots ranging in size from 10 to 6,000 units.[5] The totals for the 118 lots, for which figures were supplied, amount to 32,000–54,000 units.

These machine tools are basically what we call the industrial type and they correspond, at least in their outward appearance and their function, to American-made machine tools. In 1956, the Soviet Union claimed a production of 124,000 metal-cutting machine tools. If the latter figure is correct, the question arises as to the nature and character of the 70,000 to 92,000 units that were not produced on a lot basis. Available data show that prior to the outbreak of World War II, the Soviets were manufacturing about 200 models of machine tools and during postwar years stepped up the number of all kinds of models to about 1,500 in 1956. How many of these models were manufactured in 1956 is not known, although the Soviets refer to a figure of 847 models[6] of which about 270 models as being produced.[7] These models produced in 1956 ranged in size from the 82-kg. (0.6 kw.) Model 2A106 upright drill valued at 1,050 rubles to the 80-ton (28 kw./spindle) four-spindle milling planer valued at 567,800 rubles.[8] On the assumption that the higher figure of 847 models of industrial-type machine tools is the correct one and with data on hand that only 118 models were produced in lots greater than 10 units, another question arises. How large is the production share accounted by the 729 models (847 less 118) produced in lots smaller than 10 units each?

From the above it is clear that if all these models were produced in lots of up to 9 units each, the total could not exceed 6,561 units.

The veracity of the figures listed in the 1956 production program can be ascertained from the following table. It shows an agreement between the production program for various types of machines and the official metal-cutting machine tool production figures for the Soviet Union.

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[3] NOTE.—Industrial-type metal-cutting machine tools are defined as "* * * power driven, metal working machines, not portable by hand, that cut metal in the form of chips * * *."
[4] Kuznetsova, K. and G. Sergeyeva, "O sopostavlenii urovnev proizvoditel nosti truda v stankosstroyenii SSSR i SShA", in Vestnik statistiki, No. 6, 1960, p. 26.
[5] Zhdanov, A. I., Metodika opredeleniya ekonomicheskoy effektivnosti modernizatsii oborud ovaniya, Moscow, Gosplanizdat, 1959, pp. 97–109.
[6] Bol'shaya Sovetskaya Entsiklopediya, Vol. 40, p. 480.
[7] Kuznetsova and Sergeyeva, op. cit., p. 26.
[8] Shuvalov, Yu. A. and V. A. Vedenskiy, Metallorezhushchiye stanki, Moscow, Mashgiz, 1958, pp. 221–240.

TABLE I.—*Comparison of official totals for 1956 with the production program*

	Official totals, units	Production program		
		Number of models	Units	World War II models
Turret lathes	2,619	4	1,830– 3,130	(4)
Automatic and semiautomatic lathes	1,798	12	1,110– 2,550	(8)
Milling machines	8,596	18	4,400– 8,980	(18)
Gear cutting machines	2,390	12	1,250– 2,880	(6)
Borers	678	5	310– 930	(4)
Planers	427	3	440– 760	(3)
Brochers	332	2	200– 600	(2)
Grinders	5,225	28	3,180– 6,500	(20)
Total	21,965	84	12,720–26,330	65

Sources: For official 1956 U.S.S.R. totals, Ts.S.U. pri Sovete Ministrov SSSR, Narodnoye khozyaystvo SSSR v 1959 godu. Statisticheskiy yezhegodnik, Moscow, Gosstatizdat, Ts.S.U. SSSR, 1960, p. 211. For the 1956 production program—Zhdanov, op. cit., pp. 97–109.

The above agreement strongly suggests that in 1956, out of the total number of 124,000 metal-cutting machine tools manufactured in the Soviet Union, only 32,000–54,000 units produced in lots greater than 10 units and a maximum of 6,500 units produced in smaller lots were of the industrial type, that is "* * * power-driven, metal-working machines, not portable by hand, that cut metal in the form of chips," and valued at a minimum of 4,000 rubles each. Even if the higher figure of about 60,000 units is used, we may safely deduce that in 1956, more than 50 percent of Soviet metal-cutting machine tools manufactured were small units.

A further substantiation of the validity of this conclusion may be found in the following calculations. Between March of 1955 and the end of 1959, the Soviet stock of metal-cutting machine tools rose from about 1.7 million to about 2.0 million units, an increase of about 300,000 units.[9] During the same period the Soviet industry reportedly manufactured about 640,000 units (90,000 during the ten months of 1955, 124,000 in 1956, 131,000 in 1957, 138,000 in 1958, and 147,000 in 1959).[10] Since the past replacement rate for wear, tear, and obsolescence has ranged from 1.0 to 1.1 percent per annum and there is no information available to contradict these figures for the 1955–60 period, it should be assumed that about 100 thousand units from the newly produced machine tools were used for that purpose during the 1955–59 period. This leaves us with a figure of 540 thousand units to augment the existing stocks. Actually, the stocks show an increase of about 300 thousand units only, strengthening this author's conviction that the 240 thousand or more units do not belong to the category of industrial machine tools and that even the Soviets could not classify them as such for such inventory purposes.

It appears to this author as utterly inconceivable that the Soviets would bypass such a propaganda morsel as the assertion that they are outproducing the United States if they could only substantiate such an accomplishment. On the contrary the Soviets constantly emphasize the relative backwardness of their machine tool industry and the hope to attain the "present U.S. levels of output" at least in physical units, by 1965.

Approximately two and one half years ago, this author stated that "* * * It may be reasonably assumed that the bulk of current models turned out by the Soviet industry approach in makeup, speeds, rate of feed, etc., the U.S. models made during the late 1930's and during World War II * * *." [11] Since then, the information reaching us on the "modernity" of Soviet machine tools tends to change the above assumption into a firm and soundly based conclusion. Some of this data follows.

In 1959, a study was published in the Soviet Union on the subject of industrial plant modernization, and one of its appendixes carried a list of 118 models of machine tools which in 1956 were produced in lots of 10 or more units by plants entering the former Ministry for Machine Tool and Tool Manufacturing

[9] Narodnoye khozyaystvo, op. cit., p. 76.
[10] Ibid., p. 241.
[11] Gwyer, J. A., "Soviet Machine Tools", in Ordnance, vol. 43, No. 231, Nov.–Dec. 1958, p. 419.

Industry (MSiIP).[12] An analysis of this list shows that (1) these 118 models with only very few exceptions were industrial type machine tools; (2) they were manufactured in lots ranging in size from 10 to 6,000 units each in 48 major plants; and that (3) their combined output was between 32 and 54 thousand units as contrasted with the figure of 124 thousand for the Soviet Union as a whole. A further inquiry into this list shows that approximately 55 models were of the pre-World War II design, 34 models were introduced during the 1945–48 period, and 4 were introduced during the 1949–51 period. Dates of introduction into production of the remaining 25 models cannot be ascertained as of this moment.[13]

The combined output of pre-World War II models was 24.5 to 41.1 thousand units (76 to 77 percent of the total) and those of the 1945–48 design was 5.3 to 10.5 thousand (16 to 19 percent of the total.) The following table brings together the age of models, number of units produced in 1956 in each age of design group and the respective percentages:

TABLE II.—*1956 production program of 118 models of machine tools manufactured by 48 MSiIP plants*

[In lots of 10 to 6,000 units]

Model age	Number of models	Total of units manufactured	Percentage of total
Pre-World War II models	55	24,586–41,000	76–77
1945–48 models	34	5,271–10,540	16–19
1949–51 models	4	500–860	1.5–1.6
Undetermined age	25	1,453–1,530	6.5–2.4
Total	118	31,810–53,930	100–100

It is apparent from the above table that about 96 percent of Soviet industrial machine tools produced in 1956 on a lot-greater-than-10-unit basis were of pre-World War II and 1945–48 design.

Judging from the following statements by Soviet authorities on the obsolescence of Soviet machine tools, the situation during the 1957–60 period changed very little if any in this respect.

STATEMENTS ON OBSOLESCENCE OF SOVIET MACHINE TOOLS[14]

(Year statements were made precedes statements.)

1959: "The Moscow Plant for Internal Grinding Machine Tools has been producing for the past 10 years a thread grinder which in terms of precision is inferior to grinders manufactured abroad. Furthermore grinders produced at this plant are of poor quality * * * " (Sources: Ganshtak, op. cit., p. 11; also Promyshlenno-ekonomicheskaya gazeta, 24 May 1959, p. 1).

1957: "The Yegor'yevsk Plant "Komsomolets" is still producing gear-cutting machine tools whose cutting speeds are three times lower and power of the drive twice lower than of the same type of machine tools manufactured abroad * * *" (Source: Pavlov, P., Snashivaniye i amortizatsiya osnovnykh fendov, Moscow, Gosfinizdat, 1957, p. 140).

1959: "The Khar'kov Machine Tool Manufacturing Plant produces rotary grinders for which there is an extremely great demand, but these grinders are of an old design and do not correspond to requirements of the industry. In 1957 the plant designers turned out a series of general purpose rotary grinders (14 universal, 3 automatic, and 9 semiautomatic units) but as late as 1959, the directors and managers of the plant did not take any measures to implement their production * * *" (Source: Promyshlenno-ekonomicheskaya gazeta, 24 May 1959, p. 1)

[12] Zhdanov, op. cit., p. 97–109.

[13] Ministerstvo stankostroyeniya SSSR, Metallorezhushchiye stanki, Katalog, Moscow, Ts. B.T.I., 1949; also Ayzenshtadt, L. A. and S. A. Chikhachev, Ocherki po istorii stankostroyeniya SSSR, Moscow, Mashgiz, 1957.

[14] NOTE.—For the sake of brevity, the documentation of these statements consists only of the name of publication, its number and date, and pages on which the statement can be found. In instances where the information is derived from a monographic study, the documentation follows the standard accepted procedure.

1959: "The Middle Volga Plant in Kuybyshev is still manufacturing a 1937 model relieving lathe, Model 1A81 * * *" (Source: Promyshlenno-ekonomicheskaya gazeta, 24 May 1959, p. 1).

1960: "Soviet machine tool industry exceeded the 1959 production goals by 3.8 percent. This was attained by sidestepping the programs for the production of modern and efficient machine tools as evidenced by the fact that the Vitebsk and Khar'kov machine tool plants, Vil'nyus plant for grinders, and others continued in 1959 lot production of many machine tool models of obsolete design, first introduced about 10 years ago * * *." (Source: Mashinostroitel', No. 7, July 1960, pp. 3–4.)

1960: "* * * The 'Zahl'giris' Plant manufactures a 6P10 milling machine at a cost of 32,000 rubles. The model 6N11 milling machine, similar to the 6P10, although more efficient, is manufactured by the Dmitrov Plant at a cost of 13,730 rubles * * *." (Source: Voprosy ekonomiki, No. 5, May 1960, p. 61.)

1960: "* * * The Alapayevsk Plant started in 1958 production of a lathe about 10 percent more efficient than the 1K36 and 1K37 models. Because of the increased efficiency and precision of this new model it was decided to increase its price by 30 to 50 percent above the price for the older models. Actually the cost of manufacturing of this new lathe was 3.5 times as high as for the original models * * *." (Source: Voprosy ekonomiki, No. 5, May 1960, p. 62.)

1960: "* * * Moscow plant for grinders is still inadequately developing the work preparatory to the production of high precision gear grinders. The development of designs for precision grinders for the ball bearing industry is held up at the Leningrad plant im. Il'ich. Production goals for special purpose and unit head machine tools are not being met by Kolomna and Kramatorsk plants for heavy machine tools * * *." (Source: Stanki i instrument, No. 7, July 1960, p. 2.)

1960: "* * * Two-thirds of the 1958 output of machine tools by the im. Kirov Plant in Vitebsk consisted of obsolete units. Plant management was awarded for high output * * *." (Source: Voprosy ekonomiki, No. 5, May 1960, p. 65.)

1959: "* * * Horizontal borers mod. 2656 and 2620A manufactured in 1958 and 1959 by the Sverdlov Plant in Leningrad had defective electrical systems * * *. Grinders manufactured in Khar'kov are hazard to operate * * *. The 6N82 milling machine manufactured in Gor'kiy is shipped to "customer" plant without tools * * *." (Source: Promyshlenne-ekonomicheskaya gazeta, 19 Aug. 1959, p. 2.)

1960: "* * * The attention of the Union-Republic Councils of Ministers and of the Economic Councils should be drawn to the unsatisfactory fulfillment of the plan for developing and producing models of new and highly important machines, etc. in 1959 and the first quarter of 1960. According to the plan 759 new types of industrial equipment were to have gone into lot (series) production in 1959 and the first quarter of 1960, but the plan was fulfilled for only 425 of these * * * One of the reasons for this is that in a number of cases, the first models were of poor quality and were shipped to consumers without final finishing and testing * * *" (Source: A. Kostousov in Pravda, 15 July 1960, p. 2.)

1960: "* * * Numerically controlled milling machines so essential to automation are being assembled on a lot (series) basis at the Gor'kiy plant. A. Aristov and I. Yermak, both members of the State Committee on Automation and Machine Manufacturing of the U.S.S.R.'s Council of Ministers, express "regret" that the Soviet machine tool industry will be able to produce only 60 numerically controlled machine tools plus 400 attachments in 1961 * * *" (Source: Isvestiya, 29 June 1960, p. 4.)

1960: "* * * A. Vyatkin, Chairman of the Committee on Standards, Measures, and Measuring Instruments with the Council of Ministers of the U.S.S.R. stated that the Soviet industry specializing in production of standard tools, jigs, fixtures, and other engineering accessories currently produces one-half of the amount of standard cutting tools required by the industry and practically no special tool and other engineering equipment such as attachments, dies for forging and molding and accessories. Production of these is scattered through numerous tool shops attached to most matching manufacturing plants which manufacture them, using obsolete equipment and techniques at a cost two to three times as high as it would take to manufacture the same in a specialized plant * * *" (Source: Standartizatsiya, No. 8, Aug. 1960, p. 5.)

1960: "* * * All Soviet machine tools, including the 1K62 lathe (Krasnyy proletariyu) have defective and improperly designed safety features * * *" (Source: Ekonomicheskaya gazeta, 20 Sept. 1960.)

1960: "* * * Some of the recently designed grinding machine tools for the bearing industry by the im. Il'ich Plant in Leningrad are less productive than similar old grinders modernized by local talent * * *" (Source: Stanki i instrument. No. 9, Sept. 1960, p. 2.)

1959: "* * * The Soviet machine tool industry began production of internal grinders capable of spindle speeds of 80,000 r.p.m. * * *" (Source: V. V. Kononenko, Osnovnyye napravleniya razvitiya peredovoy tekhniki i tekhnologii v mashnostroyenii, Kharkov, Izd-vo Khar'kovskogo univ. 1959–60.

1960: "* * * Successful accomplishment of the program of development of Soviet precision machine-tool manufacture depends to a large degree on timely and qualitative supply of machine tool manufacturers with components and materials. Soviet bearing industry, the largest user of precision machine tools, owes the greatest debt to machine tool builders; this industry has not as yet provided the machine tool builders with high quality bearings of a required assortment and has not yet solved the problem of producing bearings for internal grinding spindles operating at speeds of 100,000 to 150,000 r.p.m. * * *" (Source: Editorial, *Stanki i instrument*, No. 4, Apr. 1960, p. 1–2.)

1960: "Soviet Union contemplates production of a total of 1,300 numerically controlled metal-cutting machine tools during the 1959–65 period." (Source: Gavrilov, A. N., *Sorremennoye sotstoyaniye napravleniya razvitiya tekhnologii mashinostroyeniya i priborostroyeniya*, Moscow, Mashgiz, 1960, p. 304.)

1960: An interview with designers and management of an OKB experimental (design bureau) in Odessa conducted by the editors of *Ekonomicheskaya gazeta* presents number of features of the production program of numerically controlled machine tools at the Odessa Machine Tool Plant im. Kirov. The interview makes an impression that these machines were produced for show purposes and none is used in production processes. The im. Kirov Plant built its first numerically controlled million machine "OF–41" in 1958 and subsequently the model "OF–46" machine. As of the date of the interview the plant was working on three improved versions of the "OF–41."

Designers and builders in Odessa are peeved on ENIMS. The latter, during one of the machine tool conferences in 1959, announced that it had finished drawings for recording and (sensing) reading devices to be used with numerically controlled machine tools. After numerous excuses and delays, designers of the im. Kirov plant got hold of these drawings only to find them far from completion. In the opinion of these designers, ENIMS does not want to be bothered with the task of designing unified and standardized programing components and does not want to coordinate the work in that direction by many plants in the field. (Source: *Ekonomicheskaya gazeta*, 24 Dec. 1960, p. 3.)

1960: Recently installed transfer machines at the Khar'kov's plant "Serp i molot" specializing in manufacture of diesel engines, are hand loaded and unloaded, and pieceparts coming off the line are reworked by a battery of individually operated machine tools installed behind transfer machines. These transfer machines are referred to as the "Wings of the Seven-Year Plan." (Source: *Ekonomicheskaya gazeta*, 18 Nov. 1960, p. 3.)

1960: "* * * Notwithstanding the fact that (Soviet) industry has few hundred transfer machines in operation, these in relation to the total stock of metal-cutting machine tools contain only 0.7 percent of all the machines * * *. Automatic and semiautomatic machines make up 6.5 percent of the existing stock * * *. The extent of mechanization and automation of production processes appears to be the highest in auto and tractor plants (CAZ, ZIL, KhTZ, and STZ). Even in these plants one may notice fully automatic machining side by side with manually operated machine tools. Fully mechanized machine tools, operating on an automatic cycle, can be counted in single units and in the best case in tens of units in plants outside of the automotive industry * * *." (Source: A. P. Ivanov, Mekhanizatsiya i avtomatizatsiya tekhnologicheskikh protesessov v mashinostroyenii, Moscow, Mashgiz, 1960, p. 12.)

1961: Multispindle automatic lathes manufactured by the Kiyev Plant for Automatic Machine Tools, race grinders produced by the im. Il'ich Plant in Leningrad, semiautomatic lathes turned out by the Yeysk Machine Tool Manufacturing Plant are less productive and more difficult to operate than modernized old equipment these new machine tools are to replace. (Source: Izvestiya, 31 May 1961, p. 3.)

1961: Attempt to start production of roller bearings for railroad axles is stymied by lack of production equipment. The plan to set up transfer machines for this purpose in Saratov, Tomsk, and Khar'kov bearing plants is hopelessly snagged because the Moscow Economic Council which began planning for these transfer machines three years ago has been very tardy and in fact has a "let it go attitude" (na samotek). None of the three bearing plants received as yet these machines. (Source: Ekonomicheskaya gazeta, 16 May 1961, p. 3.)

1961: "* * * The construction of the Kuybyshev Jig Borer Plant scheduled for completion in 1961 is proceeding very unsatisfactorily. Only one-half of funds appropriated for 1960 was used * * *. The reconstruction of the 'Komsomolets' plant specializing in manufacture of urgently needed gear generating machine tools is delayed * * * Moscow's im. S. Ordzhomikidze plant did not complete on time five transfer machines for ZIL (Likhachev Automobile Plant). The Kiyev Plant for Automatic Machine Tools did not organize lot production of new model 8-spindle auto and semiautomatic lathes * * *." (Source: Editorial in Stanki i instrument, No. 4, April 1961, pp. 1–2.)

1961: "* * * The retooling of the ZIL plant is held up by delays in deliveries of special machine tools and transfer machines. The machine tool manufacturing plants guilty of delays are Moscow's 'Krasnyy proletariy,' im. Ordzhonikidze, and the Grinder Plant. Khar'kov Machine Tool Manufacturing Plant and Kiyev Plant for automatic Machine Tools; and also Minsk, Korsun'-Shevchenko, Sterlitamak, and Yevsk machine tool plants * * *. Instead of originally planned 34 transfer machines, ZIL has a scaled-down agreement for only 15 machines * * *." (Source: Ekonomicheskaya gazeta, 25 May 1961, p. 2.)

1961: Soviet industry is deficient in the following types of precision machine tools; gear milling, gear shaving, gear grinding, broaching, numerically controlled machines, and precision die forging presses (mechanical). (Source: Ekonomicheskaya gazeta, 8 April 1961, p. 2.)

1961: V, Vasil'yev, Deputy Director of ENIMS describes some of the British-made machine tools at the Moscow (Sokolniki Park) British Exhibit (May–June 1961). He writes that "* * * it is obvious, that the Britishers strived to show their best metal-cutting machine tools and principally the types which are not produced by the Soviet industry * * *." Among the 20-some types of machine tools, representing seven British firms, are: six-spindle automatic lathe (tolerance of work to 0.001 mm.) made by BSA; jig grinder (tolerance of work to 0.005 mm) made by Matrix; centerless roughing grinder (tolerance of work to 0.025 mm.) made by Farmer Norton; thread grinder made by Matrix; and centerless grinder equipped with automatic inspection system and wheel wear compensator, made by Matrix. (Source: Ekonomicheskaya gazeta, 3 June 1961, p. 4.)

An analysis by the size of lots show the following distribution:

TABLE III.—*Sizes of lots manufactured by 48 plants in 1956*

Number of models	Size of lots (units)	Units manufactured	Percentage of total
57 models	10– 100	2,210– 3,730	7– 7
43 models	101– 500	6,600–14,200	21–26
10 models	501–1,000	5,000–10,000	16–19
4 models	1,001–2,000	4,000– 8,000	12–12
3 models	3,001–4,000	9,000–12,000	28–22
1 model	5,001–6,000	5,000– 6,000	16–11
118 models		31–810–53,930	100–100

Source: Zhdanov, op. cit., pp. 97–109.

A crude confirmation of the validity of this analysis especially for lot sizes of 500–1,000 and 1,000-plus units can be found in a study by A. G. Omarovskiy on the distribution of manufacturing industries of the U.S.S.R.[15] According to to his figures 55.7 percent of industrial machine tools manufactured in 1956, presumably by these 48 plants, were in lots of 1,000 units or greater, 13.8 percent in lots of 500–1,000 units, 16.1 percent in lots of 100–500 units, and 14.4 percent

[15] Omarovskiy, A. G., *Spetsializatsiya proizvodstva i razmeshcheniye mashinostroitel'noy promyshlennosti SSSR*, Moscow, Mashgiz, 1959, p. 153.

in lots of up to 100 units each. The Soviet Union had then about 78 machine tool manufacturing plants.[16]

How many of these 78 plants specialized in production of metal-cutting machine tools alone is not known. Information available shows that at least 48 of them were specialized in such production and that these 48-plus plants accounted for 93.2 percent of the total value of metal-cutting machine tools manufactured in the Soviet Union in 1956.[17] Of these 48 plants, only 14 employed production line techniques, a method of manufacturing where the machine tools and other equipment are arranged by sequence of operations instead of by grouping machines of the same kind into departments. These 14 plants produced about 40 percent of all Soviet machine tools.[18]

According to this author's findings, the following 13 plants listed in the 1956 MSiIP production program and one unlisted plant ("Zhal'giris") manufactured about 40 percent of machine tools produced by the Soviet Union in 1956.

TABLE IV.—*List of Soviet plants which accounted in 1956 for about 40 percent of the total output of machine tools*

City	Name of plant	Specialization	Number of models [1]	Total output (in units)
Moscow	"Krasnyy proletariy"	Screw cutting lathe	4 (3)	5,140- 6,360
Gor'kiy	Gor'kiy Milling Machine Plant.	Milling machines	12 (11)	2,580- 5,180
Odessa	Plant im. Lenin	Drilling machines	5 (5)	7,600-11,300
Do	Plant im. Kirov	Milling machines	2 (2)	560- 1,100
Yegor'yevsk	"Komsomolets"	Gear cutting machines	6 (4)	920- 2,100
Khar'kov	Machine Tool Manufacturing Plant im. Molotov.	Gear cutting and grinding machines.	9 (5)	1,160- 2,250
Kiyev	Plant for Automatic Machine Tool.	Turret lathes, auto- and semiautomatic lathes.	4 (4)	740- 1,660
Dmitrov	Milling Machine Plant	Milling machine	3 (3)	1,100- 2,300
Vitebsk	Dressing Machine Tool Plant.	Sharpeners	3 (3)	1,160- 2,400
Kuybyshov	Middle Volga Plant	Lathes	3 (3)	1,160- 2,400
Chkalov	Chkalov Machine Tool Plant.	Shapers and slotters screw-cutting.	2 (2)	700- 900
Tbilisi	Plant im. Kirov	Lathes	4 (4)	1,940- 3,560
Saratov	Saratov Machine Tool Plant.	Gear cutting and grinding machines.	6 (4)	270- 840
Novo-Vil'nya	"Zhal'giris"	Drilling and milling machines.	(?)	5,000- 6,000
Total			63 (53)	31,030-48,350

[1] Numbers in parentheses indicate the number of pre-1948 models.

Source: Number of models and total output: Zhdanov, *op. cit.*, pp. 97-109. The origin of models: *Yedinaya sistema planovo-predupreditel'nogo remonta* * * * Moscow, Mashgiz, 1957, pp. 207-270. Data for the "Zhal'giris" plant are from Ts.S.U. pri Sovete Ministrov SSSR v tsifrakh v 1959 godu. Moscow, Gosfinizdat, 1960; also *Vestnik statistiki*, No. 6, 1959.

A brief recap of the preceding discussion and of the data listed in Tables I to IV definitely points out the following salient features of the Soviet metal-cutting machine tool industry; (1) only about 50 percent of metal-cutting machine tools produced in 1956 were of industrial character, (2) about 90 percent of industrial machine tools manufactured in lots of 10 units or greater were produced in 48 plants, (3) about 80 percent of the industrial machine tools were produced by 14 plants employing line production techniques, and (4) 92 to 96 percent of industrial machine tools manufactured in 1956 were of World War II design. Information published in 1959–61 tends to support the theory that the bulk of Soviet metal-cutting machine tools manufactured today is relatively obsolete and that the Soviets have not solved the problem of production of technologically modern equipment.

TRANSFER MACHINES

The problems the Soviets have in solving production problems of complex and highly specialized equipment is evidenced also in the difficulties they have manufacturing automatic transfer machines. These machines designed to com-

[16] *Ibid*, p. 155.
[17] *Ibid*, p. 86.
[18] *Ibid*, p. 158. **(Note: It has been reported that in 1958, the Soviet industry manufactured 35,810 metal-cutting machine tools using the production line method.)**

plete a series of machining operations at successive stations, and to transfer the work automatically from one station to the next are of great demand and the information published in Soviet technical publications indicates that the Soviets are placing heavy emphasis on the production of transfer machines during the current Seven-Year Plan (1959–65). A total of 1,300 transfer machines are to be produced during this period. These machines are currently manufactured by the Ordzhonikidze plant in Moscow, by the Minsk Plant for Automatic Lines, Special Unit Machine Tools and Presses; by the "Stankokonstruktsiya" Plant; by the NIITMS (Scientific Research Institute of the Tractor Machine Manufacturing); by Stankoliniya Plant; and by Stankoagregat Plant. The latter two are in Moscow.

Somewhat nebulous remarks by a Western observer that visited the Ordzhonikidze Plant in 1959 suggest that "* * * machines of this sort, ranging from simple units to intricate multiple station machines, are produced in this factory at about fifty a month * * *." As matter of fact the Ordzhonikidze Plant, the largest manufacturer of transfer machines in the Soviet Union is producing only about two or three such machines per month. The entire 1958 output of transfer machines in the Soviet Union amounted to 29 machines of which only 19 with a total of 138 stations, were manufactured by the Ordzhonikidze Plant.[19] During the 1951–55 period, the plant built 18 transfer machines, and in 1957 it turned out 7 transfer machines.[20]

During the first four months of 1961, this plant completed ten transfer machines and it was putting finishing touches on the eleventh transfer machine. The group of ten machines went to ZIL and Yaroslavsk motornyy zavod, and the eleventh (8 stations) is intended for the Vladimirskiy elektromotornyy zavod.[21]

The entire output of transfer machines in the Soviet Union during the 1946–50 period was 41 transfer machines, during the 1951–55 period 67 transfer machines, during the 1957–58 period 61 transfer machines.[22]

The production goal of 250–270 transfer machines in 1965 appears to be quite unrealistic in view of the past rate of development.

PRODUCTIVITY AND MASS PRODUCTION

Some critics of Western production methods employed in machine tool manufacturing conclude that "* * * in the West there has been a failure in industrial organization and a failure of technological efficiency in the machinery-production industries * * *." In this author's opinion, the above conclusion is nothing else but a sweeping generalization, wholly unfounded and above all indicating the lack of knowledge of production problems both here in the United States and in the Soviet Union. It is obvious to anyone that machine tools are not in the same category as automobiles and here in the United States only profit motivations determine the quantities of machine tools produced. Consequently, it is futile to advocate a mass production of lathes just for the sake of producing them, when the demand for these is relatively low. In the Soviet Union, whose metal-working industry is relatively inefficient, the lathe is the easiest item to manufacture. Repeated references are made by the Soviets themselves to the effect that quotas for highly specialized metal-cutting machine tools are not met but the output of such machines as standard lathes constantly exceeds the required goals. In 1958 alone, the Soviet output of lathes exceeded 58,000 units, of which 3,000 were turret lathes, 4,100 units automatic and semiautomatic lathes, and over 50,000 units were standard lathes. The output of drilling machine tools for that year exceeded 40,000 units.[23] Obviously, the Soviets are not perturbed by the high output of such machines, since surpluses of this kind can be used very effectively as weapons of economic warfare in underdeveloped countries.

It appears only logical for the "Krasnyy proletariy" plant to employ mass-production techniques which in the case of the 1K62 lathe allowed the Soviets such economies that the man-hour requirements for a similar lathe. Right here, in this particular case of a lathe, is the Soviet industrial inefficiency plainly

[19] *Yezhegodnik Bol'shoy Sovetskoy Entsiklopedii*, 1959, p. 597–598.
[20] Arapov, I. I., "Stankostroitel'nyy zavod imeni Sergo Ordzhenikidze", in *Mashinostroitel'*, No. 1, Nov. 1958, p. 3.
[21] *Ekonomicheskaya gazeta*, 20 May 1961, p. 1.
[22] Vladzivevskiy, A., "Problemy razvitiya, stankostroyeniya v 1959–1965 godakh", in *Planovoye khozyaystvo*, No. 3, March 1959, p. 46.
[23] "Stankostroyeniye-Ekonomichesoye obozreniye," in *Ekonomicheskaya gazeta*, 17 May 1961, p. 2–3.

evident—since only by introducing mass-production methods they have reportedly decreased their man-hour requirements to a level just below that of the United States manufacturing similar equipment on a small lot basis.

The U.S. productivity is the highest in the world and the Soviets are dreaming to attain it. One of the greatest obstacles to matching American productivity is the problem of manual labor, due in the main to shortcomings in the organization of intraplant transport, repair work and maintenance of equipment, and servicing of tools. The following table brings together data on the manpower requirements in Soviet, United States, and British machine-tool manufacturing plants.

TABLE V.—*Manpower structure in U.S.S.R., U.S., and British machine-tool manufacturing plants*

	U.S.S.R.		United States		Great Britain	
	Total in 9 large plants	Total in the largest plant (Gor'kiy Milling Machine Plant)	Total in 10 plants	Total in the largest plant	Total in 11 plants	Total in the largest plant
Total number of workers	21,466	5,073	10,257	2,357	6,440	1,224
Of these in percentage:						
Direct labor	48.2	54.5	65.9	73.1	73.5	70.4
Indirect labor	51.8	45.5	34.1	26.9	26.5	29.6
Repair and service of machine tools	9.4	6.9	3.8	2.2	1.5	1.3
Repair and service of electrical equipment	2.7	2.5	1.2	1.3	.8	.7
Transport	10.3	11.4	1.8	2.9	1.3	.7
Storage	3.0	1.3	2.6	4.6	1.7	1.2
Toolroom	8.7	8.8	3.0	1.7	3.1	3.3
Inspection and control	3.7	3.2	6.3	8.9	2.1	1.2
Other support operations	14.0	11.4	15.4	5.3	16.0	21.2

Source: S. Kheynman, "Nekotoryye ekonomicheskiye problemy organizatsii promyshlennogo proizvodstva," in *Voprosy ekonomiki*, No. 1, Jan. 1960, p. 40. Data for the U.S.S.R. include Gor'kiy Milling Machine Plant (1959), "Krasnyy proletariy" in Moscow (1958), and seven other large machine tool plants (1956). Data for the U.S. and Great Britain were taken by Kheynman from Anglo-American Council on Productivity, *Metalworking Machine Tools*, 1953, pp. 18-19.

The Soviet Union is not the only country in the world mass-producing machine tools. It is a generally known fact that Brown & Sharp here in this country uses mass production methods on one of its models and that a Brazilian manufacturer, Giordani Romi, produces lathes at something around 200 man-hours per machine. This method of production definitely reduces costs but it also restricts improvements in design, a practice which the U.S. machine tool manufacturer is unwilling to follow. The reasons are more than obvious. The necessary condition for mass production is the ability to absorb large production and here in this country and also in other industrialized areas of the world, the demand for simple lathes does not justify mass production methods. A different situation exists in the Soviet Union which has been for the past four decades and still is plagued by shortages of machine tools and the mass-produced Model 1K62 shaft-turning lathe, just as its predecessor 1A62, and 1D62 Models is finding a ready market. The fact that mass-production methods restrict improvements is clearly shown in the history of these three lathe models.

Lathes are the most commonly used metal-cutting machine tools in the Soviet Union. These, as of 1 January 1956, constituted about 33 percent of all Soviet machine tools and even today these still make up about 30 percent of all the currently employed machine tools.

The 1D62 Model, commonly referred as the DIP–200 (the initials DIP mean "dognat' i peregnat' "—"catch up and surpass" the United States) was first produced in 1932 by "Krasnyy proletariy" plant in Moscow. This 4.3-kw. lathe with spindle speeds ranging from 12 to 600 r.p.m. was manufactured on a large-lot basis well into the late forties, when it became replaced by a modified Model 1A62 lathe. The latter was equipped with a 7.0-kw. motor and had spindle

speeds of 11.5 to 1,200 r.p.m. The production of the 1A62 Model started in 1949 and continued into 1957, when it in turn was replaced by the "much discussed" Model 1K62 shaft turning lathe.[24]

According to the same source, the "D" and "A" Models could not be used with tools of high speed steel and the operation of these required an excessive amount of time and effort. Despite these defficiencies, which were not corrected because of the peculiarities of Soviet mass-production methods employed in their manufacture, the Soviet Union kept on producing them just the same. Information gathered from various manufacturing establishments in the Urals shows that DIP–200 (1D62) lathe makes up about 10 percent of all metal-cutting machine tools used in that area and using this sample, Genshtak [25] estimates, that in 1957 the Soviet Union had in its machine tool stock about 170–180 thousand such units.

Since the Model 1K62 (10-kw. motor and spindle speeds of 12.5 to 2,000 r.p.m.) is an improved version of the DIP–200, it stands to reason that it is earmarked for its replacement, and only mass production methods could provide large quantities of this type of a machine tool. Some Western observers visiting the "Krasnyy proletariy" plant in Moscow expressed an opinion that it takes 200 man-hours to produce the 1K62 model and impressed by the efficiency and speed of assembly lines went on to voice a view that the Soviet machine tool industry as a whole is becoming more efficient than the machine tool industries of Western Europe or the United States. To emphasize the contrast between East and West, they even asserted that the Model 1K62 makers are three to four times as efficient as their Western counterparts.

A review of facts, and these are based on official Soviet data, shows that the Soviet machine tool industry never laid a claim to efficiencies greater than that in the West, in the United States in particular. A recent study published in a journal of the Central Statistical Administration by the Council of Ministers of the U.S.S.R.[26] shows that the labor productivity, an excellent measure of efficiency, in the Soviet machine tool industry is about 46.3 percent lower than that in the United States. The average number of man-hours to produce a standard lathe in the Soviet Union is about 615, and this figure excludes casting and forging operations.[27] At no time have the Soviets claimed a 200 man-hour lathe, and only in one instance a claim was made by Yu. Maksarey, Chairman of the State Scientific and Technical Committee of the Council of Ministers of the U.S.S.R. that "* * * it takes 20 percent less man-hours to produce Model 1K62 lathe at 'Krasnyy proletariy' than it does to manufacture a similar lathe in the United States. * * *"

A question arises as to how these Western observers arrived at the 200-man-hour figure? None of them made a close study of the production cycle and most of them asserted that they were told by the plant personnel that it takes only 200 man-hours to produce the 1K62 lathe. Since available data for Western Europe and the United States give 750–800 man-hours as the average for a standard lathe, and Maksarev's estimate of the man-hour content of the 1K62 lathe is 20 percent below the above figure, the 200 man-hour lathe will remain to be a vague assertion, till the authors of this assertion come with substantial and definite proof to the contrary.[28]

APPENDIX III

"APPRAISAL OF SOVIET MECHANIZATION AND AUTOMATION"

SOME CRITICAL ASPECTS OF SOVIET MECHANIZATION AND AUTOMATIZATION PLAN

By Joseph A. Gwyer *

Introduction.—It is of great importance that the American people should be given an insight into the Soviet mechanization and automatization program since its technological and economic consequences may affect, in the not too distant future, the economic and political position of the United States in its economic and ideological struggle with international communism. Khrushchev's

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[24] Prokopovich, V., Tekhnicheskiy progress v stankostroyenii, Moscow, Moskovskiy Rabochiy, 1957, p. 86.
[25] Ganshtak, V. I., Ocherki po ekonomike mashinostroitel'noy promyshlenhosti SSSR, Moscow, Mashgiz, 1957, p. 241.
[26] Kuznetsova and Sergeyeva, op. cit., p. 31.
[27] Ibid., p. 27.
[28] Comment: The technical content and accuracy of this article are the sole responsibility of this author.
*The author is a research analyst at the Library of Congress, Washington 25, D.C.

intimations, in his 14 November 1958 speech[1] before the graduates of Soviet military schools, that the Soviet Union will by 1970 outproduce the United States both in per capita output and in production in absolute terms, should not be dismissed as a mere boast, but should be analyzed in the light of Soviet existing and future capabilities. It should be pointed out that Khrushchev did not say directly that the Soviet Union will attain the highest standard of living in the world but implied that the highest per capita production should give the Soviet Union the highest standard of living. In the Soviet Union the term "highest standard of living" is synonymous with the highest output per capita, even if the lion's share of the output never reaches the consumer but is channeled into military goods or capital equipment intended for increasing the economic war potential of the country.

Since the American public is unaware of the significance of the emerging economic and technological competition between the U.S.S.R. and the West there is a lack of realization that the ultimate survival of the Free World depends almost entirely on how well the United States can counter Soviet economic offensive, which, as the Seven Year Plan progresses, will undoubtedly become more vigorous. A possible rapid progress of overall mechanization and automatization in the U.S.S.R. coupled with a significant drop in the cost of production may create the possibility of an expansion of Soviet exports tied to the program of political domination of undeveloped or underdeveloped areas.

Since Khrushchev placed heavy emphasis on overall mechanization and automatization of manufacturing processes as the chief means of attaining the highest per capita production, this survey is intended to provide the reader with background for the consideration of the tools and facilities the Soviet Union either has or would like to have at her disposal to wage successfully the economic and technological war against the Free World. The limits of this survey of unclassified Soviet literature must necessarily be drawn arbitrarily, and data on the progress of mechanization and automation in nonmanufacturing industries are not included.

The scope of this survey includes (1) a historical survey and the status quo of automatization in the Soviet automobile and bearing industries; (2) Soviet mechanization profile; (3) critical deficiencies in the Soviet automatization program; (4) economic considerations; and (5) observations and conclusions based on the above data.

Historical Survey and Status Quo of Automatization in the Soviet Automobile and Bearing Industries.—Since automatic manufacturing processes are most suitable for production in long series, the automobile and tractor industries and subsequently the bearing industry of the Soviet Union were the first to introduce automatic processes. The first Soviet automatic production line designed by I. P. Inochkin was placed in operation in 1940 at the Stalingrad Tractor Plant. Its function was to bore, machine, and trim STZ–NATI tractor hubs; to band, drill, and broach seats for bearings; and to perform other operations. This line consisted of four metal-cutting machine tools and a specially designed forge press; it was linked by a conveyor and supplied with loading devices. It was served by one tool setter in contrast to seven workers that were required to perform identical operations prior to "automatization." In 1940, on the instigation of A. I. Volkov, the 1 GPZ (Gosudarstvennyy podshipnikovyy zavod—State Bearing Plant) in Moscow placed in operation an automatic line for grinding tapered roller bearings. This line consisted of six centerless-type grinders linked with pipes which served as conveyors of tapered rollers. At present this line is functioning at the 9 GPZ.

Also in 1940, the 1 GPZ set in operation an automatic line for grinding the faces of ball bearing races. The line consisted of three vertical grinders linked with conveyors into which were built demagnetizing devices. Each individual grinder was equipped with a control device that would compensate for the wear of the grinding disks. An automatic line for grinding piston rods was placed in operation at the Gor'kiy Automobile Plant. It consisted of six cen-

[1] Pravda, 15 Nov. 1958, pp. 1–2.

terless-type grinders linked with a conveyor. The line included also three automatic loading devices and two elevators and was served by only one operator. A similar line, but consisting of two grinders, was introduced at the ZIL Automobile Plant in Moscow.

An automatic production line, designed by the Giproavtotraktoroprom and equipped by then 1 GPZ was placed in operation by the latter. This line permitted a simultaneous turning of twelve different-size bearing races, using locally available multi-spindle semiautomatic lathes.

The Stalingrad Tractor Plant designed and placed into operation two automatic lines for machining of suspension arms. Each line consisted of four automated engine lathes and one special horizontal borer.

In contrast to the above-mentioned lines designed and built around conventional equipment, the period between 1948 and 1953 witnessed the development of automatic lines built around specially designed machine tools and other equipment. The Khar'kov Tractor Plant's automatic transfer machine for machining cylinder blocks for the DT-54 tractor consisted of twenty unit machine tools and was served by five workers. Similar automatic transfer machines were placed in operation at the Stalingrad and Minsk tractor plants and at the "Serp i Molot" plant in Saratov. The ZIL Automobile Plant in Moscow introduced four automatic transfer machines in 1946, three more in 1950, and one in 1956. Similar automatic transfer machines were placed in operation at the MZMA (Moskovskiy zavod malolitrazhnykh avtomobiley—Moscow Plant for Small-Displacement Automobiles); Gor'kiy Yaroslavl', and Kutaisi automobile plants; and at the Minsk Tractor Plant. Modern automatic mass-production lines were also introduced at the following plants: at the Kuybyshev plant "Avtotraktorodetal' "—for valves; at the Novorossiysk plant "Krasnyy dvigatel' "—for piston rods; and in the Odessa 'October Revolution" plant—for piston rings.

During the 4th and 5th Five-Year Plans various agencies designed a total of ninety-four automatic transfer machines, but only seventy-eight of these were actually built.[2] Despite the great efficiency of automatic transfer machines, the costs of manufacturing these are very high and the length of the designing and manufacturing cycle is very long. In a number of cases, this cycle was so long that upon the delivery to the customer plant these transfer machines had to be modified and some components modernized. One of apparent causes of high cost and length of the manufacturing cycle appears to be the lack of specialized establishments for such a task and the absence of a centralized production of automatic devices. Individual sections of transfer machines are manufactured by numerous machine tool plants and instrument factories, on a piece-to-piece basis. As an example, the equipment for one of the 1 GPZ automatic lines was manufactured by eighteen machine-tool and instrument-manufacturing establishments wholly unprepared for such a task.[3] The assembly of line components was usually carried out by the customer plant, adding further to the overall delay. Quite often other than standard equipment was made by the customer plant still adding to the overall cycle. According to ENIMS data, as of 1 November 1954, a significant number of automatic transfer machines delivered to customer plants in 1952 and 1953 have not been placed in operation.[4]

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[2] Rezervy povysheniya rentabel'nosti mashinostroitel'nykh predpriyatiy (Reserves for Increasing the Profitableness of Machinery Manufacturing Establishments), Moscow, Gosfinizdat, 1957, p. 69.
[3] Ibid, p. 70.
[4] Ibid, p. 71.

The actual efficiency of individual automatic transfer machines varies as can be judged from the following table:

TABLE I.—*Economic indices for various Soviet automatic transfer machines*

Indices (1) Name of plant (2) No. of the automatic transfer machine (3) Type of product	Annual output per worker (in units)		Annual output per 1 production worker (in units)		Cost of machining per unit (in rubles)	
	Using conventional methods	On automatic transfer machine	Using conventional methods	On automatic transfer machine	Using conventional methods	On automatic transfer machine
(1) Minsk Tractor Plant (2) A849–A880 (3) Machining diesel motor cylinder heads	1,460	2,900	1,800	4,850	14.51	14.58
(1) Yaroslavl' Automobile Plant (2) 1A50–1A57 (3) Machining diesel cylinder-head surfaces	1,920	3,150	1,920	16,000	8.83	4.68
(1) Yaroslavl' Automobile Plant (2) 1A58–1A78 (3) Machining diesel cylinder-head surfaces	1,140	8,150	1,140	16,300	11.57	9.36
(1) Gor'kiy Automobile Plant (2) 1A443–1A448 (3) Cylinder heads for Pobeda motor	4,090	49,120	4,090	98,240	2.04	1.44
(1) Khar'kov Tractor Plant (2) 1C44–1A713 (3) Cylinder heads for DT-54 tractor	840	7,190	1,040	10,790	200.50	151.60
(1) ZIL (2) 1A692–1A700 (3) Inclined boring of ZIL–150	3,750	8,570	4,290	12,000	7.76	5.55
(1) "Serp i Molot" (Saratov) (2) (2A051–2A060) (2A081–2A095) (3) Cylinder heads	1,000 820	11,700 5,700	1,250 900	28,400 22,800	43.87 101.79	28.95 70.95

Source: Rezervy povysheniya rentabel'nosti mashinostroitel'nykh predpriyatiy (Reserves for Increasing the Profitableness of Machinery Manufacturing Establishments), Moscow, Gosfinizdat, 1957, p. 74.

According to official Soviet sources the cost of each of the four automatic transfer machines placed in operation in 1946 at the ZIL Automobile Plant was 7.4 million rubles; the cost of each of the three placed in operation in 1950 was 4.6 million, and the cost of the last one introduced in 1956 was also 4.6 million rubles.[5]

As of 1957, the ZIL had nine automatic transfer machines and expansion plans call for a total of fifty such lines to be in operation by 1965. The present complement of seven such machines at the NZMA is to be augmented to twenty-nine by 1965.[6] The more immediate targets for 1960 are for augmenting the present ten automatic lines at the Gor'kiy Automobile Plant to seventy; the Chyelabinsk Tractor Plant, which at present does not have any, is to have at least five lines, and the Stalingrad Tractor Plant is to introduce more than twenty automatic and semiautomatic lines.[7] The "showcase" of the Soviet automation program is undoubtedly the First State Bearing Plant (1GPZ) in Moscow. By the end of 1957 this plant had nine automatic lines and had plans for

[5] Ibid, p. 63.
[6] Zvorykin, A. A., Avtomatizatsiya proizvodstva i yeye ekonomicheskaya effektivnost' (Automation of Production Processes and its Economic Effectiveness), Moscow, Izd-vo "Znaniye", 1958, p. 21.
[7] Dumler, S. A., Potochnyye metody proizvodstva v mashinostroyenii (Flow Methods of Production in Machinery Manufacturing), Moscow Mashgiz, 1958, p. 4–5.

thirty-seven by 1965.[8] During the 1951–57 period the plant placed in operation seven automatic lines, rebuilt 950 machine tools, and equipped 650 machine tools with automatic attachments.[9] The plant claims to have the "first in the world" fully automated ball bearing shop.

During the past seven years the output of bearings was doubled without adding new equipment. It should be added here that most of the machine tools used at the 1 GPZ are on the average twenty to twenty-five years old.[10] Specifically, thirty-three four-spindle semiautomatic lathes more than twenty years old were completely rebuilt. This "modernization" consisted of replacing spindle drums, equipping the lathes with automatic operators and specially designed transporters, and replacing the bearings. Similar "modernization" took place on fifty-seven multispindle (Model 1261P) semiautomatic lathes.

Soviet Mechanization Profile.—The most definitive manifestation of technological progress is the expanded use of machinery and mechanical processes. The primary purpose of the Soviet drive for overall mechanization has been to reduce the kind of labor required to turn out a product. A lesser but still pressing consideration is the amount of labor which during the 1959–1965 period and perhaps during the latter part of the sixties may become not as plentiful as is commonly thought because of the extremely low birthrate during World War II, the very high infant mortality, and high manpower losses during the corresponding period.[11] Despite strenuous efforts to mechanize during the past thirty years, the mechanization of Soviet manufacturing processes is far from being adequate. In branches of Soviet industry where the mechanization of primary production processes is quite extensive, the volume of operations performed by manual labor, especially in supporting operations is quite large.[12] A considerable volume of manual labor goes into lifting, conveying, and material storage operations, quality control, etc. Of these, conveyor and material storage operations are the most critical, since they do account for 25 to 30 percent of total volume of labor expended in manufacturing operations. According to the census of 5 May 1954, the following are percentages of manual workers engaged in industrial operations: [13] ferrous metallurgy—34.6 percent; coal mining—44.1 percent; machinery manufacturing—48 percent; lumbering—67.8 percent; and building construction—69 percent. On the average more than 55 percent of the 7.2 million workers employed in 15 various ministries responsible for these operations were performing manual labor.

The automobile manufacturing industry is considered to be one of the most mechanized industries in the Soviet Union. Despite its salient importance, this industry also suffers from inadequate mechanization of primary processes and the complete absence of mechanization of supporting operations. Specifically, studies show that because of this the volume of manual labor going into the manufacture of the MAZ–200 automobile at the Minsk Automobile Plant amounted recently to 44.3 percent and into the manufacture of the ZIS–585 dump truck at the Mytishchi Machinery Manufacturing Plant to 47.8 percent.[14]

In such heavy machinery manufacturing establishments as Kramatorsk, Uralmash, Yuzhuralmash, Irkutsk, and other plants, manual labor accounts for 50 to 70 percent of the total labor employed at these installations. In plants which up till recently were administered by the Ministry for Instrument Making (Ministerstvo Priborostroyeniya), where by Soviet standard the mechanization is at its highest levels, manual workers make up from 35 to 40 percent of total of workers employed and in some cases as high as 60 percent.[15] In many plants

[8] Zvorykin, op. cit., p. 21.
[9] "Shire vnedryat' avtomatizatsiyu proizvodstvennykh protsessov" (Automation of Production Processes Should Be Introduced on a Wider Scale), in Mekhanizatsiya Trudoyemkikh i Tyazhelykh Rabot, no. 4, 1958, p. 3.
[10] Rezervy . . ., op. cit., p. 54.
[11] Rybkin, N. P. and A. M. Gevorkyan, Novaya tekhnologiya v mashinostroyenii (New Technology in Machinery Manufacturing), Moscow, Izd-vo "Znaniye", 1958, p. 39–40.
[12] Kuzmin, I. I., "O zadachakh razvitiya kompleksnoy mekhanizatsii i avtomatizatsii v SSSR" (On the Development of Overall Mechanization and Automation in the U.S.S.R.), in Vestnik Akademii Nauk SSSR, v. 28 no. 7, 1958, p. 9 (The author is Vice-Chairman of the Council of Ministers and Chairman of the State Planning Commission).
[13] Strumilin, S. G., Ekonomicheskiye problemy avtomatizatsii proizvodstva (Economic Problems Arising from Automation of Production Processes), Moscow, Gospolitizdat, 1957, p. 22.
[14] Bakulev, G. D., "Zadachi ekonomicheskikh nauk v oblasti avtomatizatsii proizvodstva v promyshlennosti" (Role of Economic Sciences in the Realm of Production Automation in the Industry), in Sessiya Akademii Nauk SSSR po nauchnym problemam avtomatizatsii proizvodatva, 15–20 oktyabrya 1956. (Plenarnyye zasedaniya), Moscow, 1957, p. 241.
[15] Ibid.

producing complex machines and equipment requiring line production and automatic machine tools, the movement of heavy parts, unloading of raw materials, and other supporting operations are carried out haphazardly mostly by hand, and often by skilled labor diverted from their primary duties.[16] Soviet industrial engineers found out that such a partial mechanization created scheduling difficulties and did not solve production problems, but on the contrary complicated them out of proportion to benefits achieved. The lack of mechanization of supporting operations almost always affected the operations of main shops, causing in many instances interruptions in operations and inadequate loading of equipment; consequently "crash programs" to catch up with the backlogs were usually followed by extensive breakdowns of both equipment and production schedules.[17]

Critical Deficiencies in the Soviet Automatization Program.—Introduction of automatic processes into manufacturing operations depends largely on the availability of appropriate and suitable production facilities which in themselves offer an area for a technological development. One of the retarding factors to such an introduction is the inadequacy of existing Soviet production facilities, especially those of the machinery and automobile manufacturing establishments.[18] The responsibility for alleviating this "deplorable" condition rests with the Gosplan U.S.S.R. (State Planning Commission), Gosekonomkomissiya U.S.S.R. (State Economic Commission), and the respective Ministries. These groups are required to take into consideration, when drawing annual and future plans for the development of the Soviet economy, the available industrial equipment requiring replacement because of obsolescence and to provide in individual plans for appropriate establishments for the production of modern machines and equipment on a scale that would permit the replacement of obsolete units and complexes. Very little replacement of worn and obsolete equipment has been done during the past two or three decades and the general attitude of the responsible agencies to this problem can be found in the commonly expressed complaint that it is "not by skill but by numbers" (Ne umeniyem a chislom) that things are accomplished in the U.S.S.R.[19] This biting and critical observation, uttered before a large audience attending the U.S.S.R. Academy of Sciencies session on automation held in 1956 in Moscow, is quite representative of that group within the Soviet Union which would rather dispense with the stereotype propaganda in official pronouncements and point out deficiencies in all their realities.

What can be seen in the U.S.S.R in the realm of automatization? Obviously not too much. This state of affairs can be explained by the fact that the U.S.S.R. is barely entering the economic phase of industrial developments referred to as "automation."[20] In particular, the Soviet pool of metal-cutting tools in 1957 consisted of about 1,840,000 units, but there were altogether only about 100 automatic transfer machines in operation.[21] Conventional production lines are more numerous, but this is an unassuming beginning when "* * * one considers that manual labor is used along production lines to a large extent (more than 50 percent of all operations along the production line are performed by manual labor) * * *."[22]

According to preliminary computations of the Gosplan U.S.S.R. during the 1959–1965 period the Soviet Union should introduce 1,400 automatic lines which will require 12,000 to 14,000 metal-cutting machine tools.[23] The supply of automatic and semiautomatic machine tools suitable for inclusion in automatic lines remains inadequate. A considerable portion of machine tools manufactured in the Soviet Union consists of general purpose units and according to Kuzmin only a few of these can be equipped with rapid-action set-up, clamping, measuring, and other attachments.[24]

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[16] Rotshteyn, A. I., Metody izmereniya proizvoditel'nosti truda v promyshlennosti (Methods of Measuring Labor Productivity in the Industry), Moscow, Gosstatizdat, 1957, p. 29–30.
[17] Ibid.
[18] Pervukhin, A., "Moral'nyy iznos oborudovaniya i normy amortizatsii" Obsolescence of Equipment and Amortization Rates), in Voprosy Ekonomiki, no. 1, 1957, pp. 122–123.
[19] Fedorov, I. F., "Vystupleniye" (Presentation), in Sessiya Akademii Nauk SSSR po nauchnym problemam avtomatizatsii proizvodstva, 15–20 Oktyabrya 1956. (Plenarnyye zasedaniya), p. 257, Moscow, 1957.
[20] Strumilin, op. cit., p. 24.
[21] Gwyer, Joseph A., "Soviet Machine Tools" in Ordnance, v. 43, no. 231 Nov.–Dec. 1958, p. 417.
[22] Strumilin, op. cit., p. 24.
[23] Kuzmin, op. cit., p. 11.
[24] Ibid., p. 9.

As of 1955, the total number of automatic and semiautomatic machine tools in the U.S.S.R. was less than 50,000 units.[25] The overall structure of Soviet machine-tool output does not hold promises for a speedy program of automation. Soviet industry is experiencing shortages of modern automatic and semiautomatic machine toools, while her machine tool manufacturing establishments are turning out an unduly large percentage of engine lathes, as can be seen from the following table:

TABLE II.—*Soviet machine-tool production, 1951–55, by types (in percent of total)*

Type	Year						
	1951	1952	1953	1954	1955	1957	1958
Engine lathes	32.40	32.00	29.80	29.80	28.70	25.5	24.6
Turret lathes	2.22	2.25	2.18	2.30	2.50	2.2	2.1
Milling machines	5.37	5.88	5.47	6.24	6.28	8.9	8.8
Gear-cutting machines	2.73	2.25	2.48	1.63	1.68	2.1	1.9
Broaching machines	.38	.26	.24	.28	.26	.4	.4
Grinding machines	5.68	4.26	3.67	3.35	3.38	4.5	4.4

Source: Rybkin, A. P., and A. M. Gevorkyan, Novaya tekhnologiya v mashinostroyenii, (New Technology in Machinery Manufacturing), Moscow, Izd-vo "Znaniye," 1958, p. 42.

Engine lathes comprise more than 30 percent of Soviet machine-tool stocks and are produced at a rate of about 30 percent of the total annual output. The output of turret lathes is considered by the Soviet as inadequate (2,825 units in 1955 and estimated 2,977 units in 1957). The output of broaching machines (307 units in 1955 and estimated 364 units in 1957) is also inadequate and the inability of the Soviet machine-tool industry to satisfy domestic needs prompted the U.S.S.R. to seek out Western producers with the idea of purchasing their equipment. The growth of the instrument industry is retarded to some extent by the insufficient output of grinders (3,959 units in 1955 and estimated 3,960 units in 1957). Although in absolute numbers the output of grinders did not change during the 1951–1955 period, its percentage of the total of machine tools produced in the U.S.S.R. dropped from 5.68 percent in 1951 to 3.38 percent in 1955. A critical situation also exists in the supply of gear-cutting machine tools.[26] The Soviet Union up till 1950 relied to a large extent on imports of bevel and spiral gear generators and despite strenuous efforts on the part of ENIMS (Eksperimental'nyy nauchnoissledovstel'skiy institut metallorezhushchikh stankov—Experimental Scientific-Research Institute for Metal-Cutting Machine Tools) the demand has not been met by the Soviet machine-tool industry. The output of gear generators rose from 1,658 units in 1950 to about 2,600 in 1957. According to Rybkin and Gevorkyan, the demand for the following two groups of machine tools has not been met by the domestic industry and their critical supply is a retarding factor in the Soviet program for overall mechanization and automatization: Group 1—grinders, jig borers (with program control), and gear-cutting machine tools; Group 2—four-, six-, eight-, twelve-, and sixteen-spindle, vertical semiautomatic lathes suitable for machining piece parts up to 800 mm in diameter.[27]

A survey made during the midyear of 1958 of the production quotas for various types of machine tools shows that the six-month plan for production of highly complex units was not met by the machine tool industry, while the quotas for little productive and outmoded units were surpassed by some 4500 units.[28] If the situation in regards to some types of machine tools appears to be critical, the state of affairs in the instrument and electronic industries charged with the responsibility of providing the automatization program with suitable devices and instruments is even more critical as can be judged from the following excerpts from papers delivered at the October 1956 session of the U.S.S.R. Academy of Sciences on problems of automatization.

[25] Strumilin, op. cit., p. 10.
[26] Prokopovich, A. Ye., Tekhnicheskiy progress v stankostroyenii (Technical Progress in Machine-Tool Manufacturing), Moscow, Moskovskiy Rabochiy, pp. 16–17, 1957.
[27] Rybkin and Gevorkyan, op. cit., p. 43.
[28] Yevenko, I., "Proverka i ekonomicheskiy analiz vypolneniya planov" (Review and Economic Analysis of Plan Fulfillment), in Planovoye Khozyaystvo, no. 10, Oct. 1958, p. 7.

According to these, there is still a considerable lag in the field of manufacture of analogue devices when compared with foreign countries. The greatest drag on the manufacture of these is exerted by the shortage of high-grade parts and components which should have been supplied by the Soviet radio-industry factories.[29] A paper by B. T. Kolomiets points out that Soviet industry has not yet sufficiently well coordinated and exploited the findings of scientific research organization investigating the use of semiconductors, thus creating a lag in their application.[30] A paper by O. V. Slezhanovskiy was devoted to a survey of the status of the Soviet electronic industry and in particular of electric motors in the U.S.S.R. and abroad. The paper notes that the U.S.S.R. lags considerably in volume of output of semiconductors and pumpless mercury rectifiers, of a complete line of magnetic amplifiers, and of saturated reactors.[31] Lecturers and participants in discussion on the subject of "Telemechanization of Manufacturing Processes" have noted that despite its great technological and economic advantages, telemechanization is used in the U.S.S.R. on a very limited scale, and only in power systems and to some extent in transport.

An obvious retarding factor to its wider employment in other branches of the Soviet industry is the lack of facilities capable of manufacturing telemechanical apparatus suitable for general industrial use. Even the telemechanical apparatus for Soviet power systems is of very poor quality.[32] The above paper emphasizes that the lag of Soviet electrical equipment and instrument output behind that of Western European countries is deplorable in regards to nomenclature, quality, and rate of production.[33] As a specific example, one of the co-authors of the above study cited a case where 82 percent of the automation equipment components scheduled for one of the units of the Kuybyshev Hydroelectric Power Station were found defective at the site prior to installation and had to be shipped back to the manufacturer for a complete reworking.[34]

These shortages and deficiencies were previously recognized by the Central Committee of the Communist Party of the U.S.S.R. and the Council of Ministers, both of which resolved during the 20th Congress of the Communist Party (1956) to adopt measures for a rapid development of industries charged with the responsibility of providing necessary automatization equipment. These resolutions envisaged the construction of 39 new and the reconstruction of 17 existing instrument manufacturing plants during the 1956–1960 period at an approximate cost of 3 billion rubles.[35] Despite the urgency, the progress in this direction was slow, and only 20 percent of the program was accomplished during 1956 and 1957. As of 1958, many instrument-manufacturing plants were still without testing facilities, adequate laboratories, and design bureaus.[36]

Automatic equipment cannot be produced unless and until sufficient personnel qualified to design and build it becomes available. Even if its production becomes technically possible, there still is the problem of specialized labor to operate and service it. Many factors present in the Soviet Union impede the development of overall automatization. The most important of these are: (1) the use of obsolete equipment not suitable for automatization, (2) an insufficiently developed instrument industry, (3) an insufficient number of automation

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[29] Trapeznikov, V. A. and B. Ya. Kogan, "Sostoyeniye i osnovnyye napravleniya razvitiya elektronnogo modelirovaniya v avtomatike" (Electronic Analogues, the Prospect for their Development and of their Use in Automation), in Sessiya Akademii Nauk SSSR po nauchnum problemam avtomatizatsii proizvodstva, 15–20 oktyabrya 1956. (Osnovnyye problemy avtomaticheskogo regulirovaniya i upravleniya), Moscow, 1957, p. 310.

[30] Kolomiets, B. T., "Poluprovodniki i ikh primeneniye v avtomatike" (Semiconductors and their Application in Automation) in Sessiya Akademii Nauk SSSR po nauchnym problemam avtomatizatsii proizvodstva, 15–20 oktyabrya 1956. (Nauchnyye osnovy postroyeniya tekhnicheskikh sredstv avtomatiki), Moscow, 1957, p. 54.

[31] Shiezhanovskiy, O. V., "Sostoyaniye avtomatizirovannogo elektroprivoda v vedushchikh otraslvakh promyshlennosti" 'Status of the Automated Electric Drive in Leading Branches of the Industry), in Sessiya Akademii Nauk SSSR po nauchnym problemam avtomatizatsii proizvodstva, 15–20 oktyabrya, 1956. (Nauchno-tekhnicheskiye problemy avtomatizirovannogo elektroprivoda), Moscow, 1957, p. 168–172.

[32] "Resheniye sovesrchaniya elektrikov instituta Gidroenergoproyek" (Resolutions of the Conference of Power Engineers of the "Gidroenergoproyekt" Institute), in Novoye v proyektirovanii elektricheskoy chasti gidroelektrostantsiy, Moscow, Gosenergolzdat, 1957, p. 218.

[33] Ibid., p. 220.

[34] Losyatinskiy, A. Z., "Ob uluchshenii skhem i apparatury avtomatiki gidroagregatov na osnovanii opyta ekspluatatsii i naladki" (On the Improvement of Automation System and Apparatus for Hydroelectric Power Units Based on Experimental Operations and Loads), in Novoye v proyektirovanii elektricheskoy chasti gidroelektrostantsiy, Gosenergoizdat, Moscow, 1957, p. 145.

[35] Kuzmin, op. cit., p. 14.

[36] Ibid., p. 15.

specialists, (4) poor organization of scientific research in the field of automation of manufacturing processes, and (5) the lack of scientifically founded methods for the design and construction of required equipment.[37] Confirmation of item (3) above can be found in Kuzmin's article published in the summer of 1958, in which he states that there was not a single school of higher education in the Soviet Union with faculty for training automation specialists.[38] The fact that in 1955 the U.S.S.R. surpassed the U.S. in the number of engineers (586,000 to 550,000) is a meaningless boast, points out Strumilin.[39] According to the latter, Soviet engineers learned well the steam-locomotive end of business, but long experience with steam created only shellback habits as shown in the difficulties encountered in attempted transition from steam to electric-diesel type of locomotive. Automation requires modern education and training programs, new tests, new and special schools, and, according to Strumilin, these are still lacking.

An unfavorable effect on the development of automatization of production processes is being created by the inadequacy of theoretical concepts. If the development of linear theory of regulating one parameter can be considered as basically adequate, the theory of regulating systems with several regulated magnitudes related to a technological process, still appears to be only in the primary stage of development. The Soviet Union considers herself on par with the West (U.S.) in the realm of the theory of automatic control, but she admits that in terms of level and volume of automation of industry she is "substantially" well behind.[40]

Economic Consideration.—Soviet economists and industrial planners are in general agreement that overall mechanization and automation would permit the following: (1) increased productivity of equipment without increasing its size, (2) reduced volume of support equipment, (3) decreased production areas through a reduction in the quantity of primary and support equipment and through a more rational production-area layout, and (4) reduced equipment costs in connection with its reduction in size and weight.[41] Though this agreement exists in principle, there are still signs that Soviet economists have not reached an agreement on the basic definitions and criteria of economic effectiveness of automatization, and even as late as 1958 have not worked out the theory of "profitableness" and economic effectiveness for an automation program that could be instituted in a socialist state.[42]

These problems were pointedly underlined by I. F. Tevosyan, former Vice-Chairman of the Council of Ministers of the U.S.S.R. during the XX Congress of the Communist Party when he stated that "* * * Soviet economic and planning agencies in solving industrial economic problems were the least of all concerned with the per-unit cost of production.[43] According to Fedorov, the Soviet Union for the past thirty years, had followed the same concepts of applied economics, which over this long period became dogmas; these concepts are outmoded, and Soviet planning methods, accounting and wage systems, and methods of setting standards only enhance bureaucracy and irresponsibility, both of which hinder the introduction of new and progressive economic methods.[44] Lossiyevskiy claims that automation of production processes in the Soviet Union has been made very difficult because of an almost complete absence of data on plants to be automated, on their status and dynamic features, and because of difficulties encountered in attempting to conduct experimental automation studies under normal production conditions.[45] Many production processes are not well suited for automation not only because of inadequate mechanization levels but also because the existing Soviet equipment is technologically not adaptable.[46] A compelling handicap appears to be the existence of expensive

[37] Shumilovskiy, N. N. and V. L. Lossiyevskiy, "Osnovnyye zadachi razvitiya nauki v oblasti kompleksnoy avtomatizatsii proizvodstvennykh protsessov" (Fundamental Objectives of Science in the Overall Automation of Production Processes), in Sessiya Akademii Nauk SSSR po nauchnum problemam avtomatizatsii proizvodstva, 15–20 oktyabrya 1956. (Kompleksnaya avtomatizatsiya proizvodstvennykh protsessov), Moscow 1957, pp. 7–26.
[38] Kuzmin, op. cit., p. 16.
[39] Strumilin, op. cit., pp. 35–36.
[40] Lossiyevskiy, V. L., "O zadachakh avtomatizatsii proizvodstvennykh protsessov" (Objectives in Automating Production Processes), in Avtomatizatsiya proizvodstvennykh protsessov, v. II. Akademiya Nauk SSSR, Moscow, 1958, p. 9.
[41] Lossiyevskiy, op. cit., p. 10.
[42] Kuzmin, op. cit., p. 16.
[43] XX s'yezd KPSS, Stenograficheskiy otchet (Twentieth Congress of the Communist Party of the Soviet Union), Moscow, Gospolitizdat, 1956 p. 221.
[44] Fedorov, I. F., "Vystupleniye" op. cit., p. 258.
[45] Lossiyevskiy, op. cit., p. 8.
[46] Ibid.

plants equipped with such machinery, since the decision to modernize for automation versus scrapping of existing equipment and its replacement with new automatic or semiautomatic machines suitable for automation is quite a difficult one. In various branches of the Soviet industry, the automatization in whatever form it exists is only partial, and embraces individual pieces of equipment in the technological chain of manufacturing processes.

The value of capital expenditures going into the automatization of Soviet chemical, petroleum, and metallurgical industries runs at a level of about 2 to 4 percent of total new investments, while in the U.S. capital expenditures for automatization of these industries range from 15 to 25 percent of the total.[47]

The ratio of capital expenditures for the automatization of automobile and tractor manufacturing processes is higher but since Soviet planners recognized the primary need for overall mechanization prior to wider introduction of automatization, the new investments are relatively insignificant.

Conclusions.—Soviet propaganda claiming technological and economic gains is exaggerated and its primary purpose is to make the Free World believe in U.S.S.R.'s industrial invincibility. Aided to some extent by those who accepted at face value her claims to industrial prowess, the Soviet Union during the past two years succeeded in creating this impression. Her spectacular technological achievements, attained through crash programs conducted at the expense of research and development not contributing directly or indirectly to the military effort, are lacking in depth and breadth and her nonmilitary industries contain little that the West should envy or be alarmed about. These conclusions are based on facts drawn from official Soviet sources. The fact that the Soviet Union is constantly expanding her primary industries does not attest to similar expansion in manufacturing industries. The continuous and relentless drive for quantity rather than for quality has resulted in paradoxes, and has created material and technological bottlenecks from which the Soviets may not extricate themselves.

The 1958 Brussel's Fair was an ideal place for the U.S.S.R. to exhibit samples of her industrial "might." The industrial exhibits with machine tools, instruments, etc., were impressive to the untrained eye and to the uninformed onlooker. These exhibits, coupled with skillful narratives and baskets-full of handouts, achieved their purpose by creating an impression that the Soviet Union has as much or more, and as good if not better machines and equipment than the West. In reality the machines and instruments exhibited are in critical demand in the Soviet Union. This scarcity, and the fact that what is available is of substandard quality, retard the Soviet Union's industrial development in general and her attempts to "automate" in particular. A Western labor leader, recently a visitor to the U.S.S.R., related that when he visited a Soviet machinery plant he observed that most of the machine tools and other equipment in use were obsolete. To his inquiry as to the whereabouts of the new and numerous modern machine tools the Soviet Union claimed to have, an obviously unrehearsed Soviet worker replied: "Well, some of these are at the Moscow Fair, and the rest must be in Brussels." Perhaps this quip is far fetched, but when one considers the facts, this straight and simple reply echoes an element of truth.

What has the Soviet Union achieved in the realm of overall mechanization and automation since 1955? Some answers to this question can be found in the findings of the All-Union Conference of Soviet industrial workers which took place at the Kremlin on 12–16 May 1958, to discuss some of the more urgent problems facing the Soviet industry in this respect.[48] The findings of the Conference point out that despite such achievements as Sputnik, atomic energy programs, etc., there are still serious shortcomings which have to be alleviated. Despite the resolutions of the XX Congress of the Communist Party of the Soviet Union (1956) to accelerate the automatization of manufacturing processes, the progress in that direction has been slow. Theoretical studies of automation are still carried out on an inadequate scale and same can be said about the studies of technological processes that could facilitate the introduction of mechanization and automatization. The modernization of the technological apparatus to meet the requirements of automatization was quite inadequate. The number of available semiautomatic and automatic machine tools and automatic production lines is insufficient and numerous technological processes still require a large expenditure of physical effort (manual labor). The mechanization level of storage and

[47] Strumilin, op. cit., p. 12.

[48] "Za pod'yem kompleksnoy mekhanizatsii i avtomatizatsii proizvodstva" (For the Rise in Overall Mechanization and Automation of Production Processes), in Avtomatika i telemekhanika, v. 19, no. 6, June 1958, p. 517–518.

handling operations is low. Soviet industry is lacking a unified technical policy on principal problems of automation. There is a drift and disjointedness in instrument manufacturing and a significant lag in designing of new methods and apparatus for automatic control, especially of data units for the control of physicochemical processes, etc. The training of personnel in rudiments of instrument manufacturing and automatization of manufacturing processes is also inadequate. Economic studies of the efficiency of automatization are lagging and the interchange of technical data dealing with automatization is very poor. Among other serious shortcomings are the slow rate of introduction of leading practices and an over-long lag between the data of pertinent inventions and their practical implementation.

Some of these findings have been echoed by Khrushchev [49] who, in his 14 November 1958 speech before the graduates of Soviet military schools, stated that in order to attain the economic goals set forth by the Seven-Year Plan (1959–1965), it is of primary importance for the Soviet Union to expand the production of the most modern machine tools, equipment, instruments, and other means for overall mechanization and automatization. This is quite an undertaking when one considers that in 1955 the Soviet per capita physical output of capital equipment was only about 28 to 30 percent of the per capita output of the United States during the same year.[50]

Can the Soviet Union attain these goals within the indicated period of time? It is very doubtful, since a progress toward full automation can only be achieved through a uniform mechanization and this the Soviet Union is lacking. Furthermore her progress will be slowed down by inadequate number of designers, prototype makers, production engineers and other highly specialized personnel. It may take her 15 to 20 years with the best training programs and with a full complement of required machines and instruments.[51] This period could be shortened to some extent should the Soviet Union go beyond her sphere of interests for direct and indirect help. There are some indications to this effect contained in Soviet East-West trade proposals, where the primary Soviet interest rests in modern machine tools, equipment for her chemical industry, and in the engineering know-how, especially that of the United States. Is it not paradoxical that the U.S.S.R., whose aim is to destroy the Free World through an economic and political penetration, would turn to the United States, the champion of the Free World, for economic help? This "zig-zag" in Soviet foreign policy should be scrutinized in every detail since it has become a matter of vital importance for the West in general and the United States in particular not to allow themselves to be outpaced by the Soviets in areas of technological and economic progress that would further Soviet gains in the economic war. Lending of support to the Soviet industrialization drive might nullify all Western attempts to contain politically the Soviet Union and might constitute a retreat which eventually may end in a national disaster.

The sole responsibility for the content and technical accuracy of this article rests with the author.

APPENDIX IV

(The following comments were received by the subcommittee from persons mentioned by Mr. Gwyer and representatives of publications to which he referred:)

HARRON RICKARD & MCCONE CO., OF NORTHERN CALIFORNIA,
San Francisco, Calif., November 8, 1961.

Mr. J. G. SOURWINE,
Chief Counsel, Internal Security Subcommittee,
U.S. Senate,
Committee on the Judiciary,
Washington, D.C.

DEAR MR. SOURWINE: I appreciate your letter of October 30 and am grateful to Senator Keating for having extended the opportunity to appear before your subcommittee. I am embarrassed to say that I am not familiar with the information which was being pursued by the committee in this instance and accordingly cannot predict the value of any testimony I might give.

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[49] Pravda, 15 Nov. 1958, p. 1–2.
[50] Rotshteyn, op. cit., p. 14.
[51] Strumilin, op. cit., p. 24.

The testimony which you attached to your letter would seem to have established in the record the fact that I have differed wholeheartedly with Mr. Joseph A. Gwyer, who testified before the subcommittee on October 23. This is certainly a correct representation in that I have read two articles which were written by Mr. Gwyer, one which appeared in Ordnance magazine; another which was written and to the best of my knowledge not published. Both of his articles seem to convey the impression that the Soviets are lagging far behind America in the production of machine tools. This seems to be so completely contrary to all available information by reliable authority as to have raised some serious questions in my mind regarding Mr. Gwyer and his source of information.

If by chance your subcommittee finds it is seriously concerned with an appraisal of the American machine-tool industry as compared to that of the Iron Curtain bloc in general or the Soviets in particular, I believe that you will have many expert witnesses available to you for testimony. I for one should be happy to cooperate if called upon to do so. In that connection I might venture the personal opinion that the Soviets are at the present time producing machine tools for their own use at a rate higher than 4 to 1 over the production of machine tools in America for American consumption. I should also like to offer the opinion that if this present rate continues through the balance of the 1960's Mr. Khrushchev's prediction of industrial supremacy will become a tragic reality for all Americans to acknowledge. This opinion is shared by many responsible people in the executive branch of the present administration.

In view of my rather strong apprehension about this situation I hope it is understandable that I would differ with Mr. Joseph A. Gwyer.

I will appreciate your comments or suggestions if you feel that I could serve the interests of the subcommittee further.

Yours very truly,

J. O. ELLISON.

MACHINERY,
PUBLISHED BY THE INDUSTRIAL PRESS,
New York, N.Y., November 1, 1961.

COMMITTEE ON THE JUDICIARY,
U.S. Senate, Washington, D.C.
(Attention of J. G. Sourwine, chief counsel, Internal Security Subcommittee.)

GENTLEMEN: Answering your letter of the 30th, there is a very simple explanation for the action taken by Machinery's editors in connection with the article contributed to Machinery by Mr. Joseph A. Gwyer in 1959, which is that Machinery is a technical journal dealing with the facts about the technique and practice of the metalworking industry. Its articles have to do with these facts rather than with any expressed opinions, however soundly based they may be.

You may rest assured that no one in this organization has the slightest desire to protect the interests of the U.S.S.R.; quite the contrary. For some time now we have refused to accept Russian subscriptions or to renew those which had previously been in effect.

Sincerely yours,

R. B. LUCHARS, *Publisher.*

THE NEW YORK TIMES,
November 1, 1961.

Mr. J. G. SOURWINE,
Chief Counsel, Internal Security Subcommittee,
U.S. Senate, Washington, D.C.

DEAR MR. SOURWINE: Thank you for your letter telling me of Mr. Gwyer's brief citation to material I wrote for the New York Times. I do not see any need for me to testify since at worst Mr. Gwyer, in the excerpt you sent me of his testimony, accuses me of having made a mistake, which is always possible. The excerpt you sent me does not, however, document or prove in any way that the quoted excerpt from my writings is a "misstatement" as charged, and at the moment I believe that what I wrote was accurate. Additional evidence could change my mind, of course.

It does seems to me, however, that it would be fairer to all concerned if your record contained the full text of my article—a copy of which is enclosed—rather than the brief excerpt. Also I would hope that your record would note that

the following statement appeared in Fortune magazine for October 1961, page 109:

"In metalcutting machine tools, Soviet 1960 production of 154,000 tools exceeded U.S. output in its best recent year (1952) by 60 percent, and was more than triple U.S. production for 1960."

If I am in error on this point, as Mr. Gwyer seems to believe, then I err in very respectable company. But I repeat, I have as yet seen no evidence to convince me that either Fortune or I is wrong on this point.

Sincerely yours,

HARRY SCHWARTZ.

The text of Mr. Schwartz' article follows:

[New York Times, Oct. 19, 1961]

U.S. LEAD SUBSTANTIAL

By Harry Schwartz

Premier Khrushchev's declaration of confidence that the Soviet Union would soon outproduce the United States appeared to be based upon the success his country has had in narrowing the U.S. production advantage. But the U.S. lead in the economic race is still substantial.

Any attempt to give a precise evaluation of the present status of the competition comes up against the fact that conclusions depend upon what one measures and even how one measures it.

Last June, for example, President Kennedy focused on total production of all goods and services—what economists call the gross national product—and reported that the Soviet Union in 1959 produced only about 47 percent as much as the United States.

But Premier Khrushchev prefers to focus on industrial production alone, declaring that Soviet factories and mines now produce more than 60 percent as much as their U.S. counterparts. This makes the U.S. lead less imposing and, by Premier Khrushchev's reckoning, the Soviet Union will have caught up by 1970 or earlier.

One of the reasons for the discrepancy is that the U.S. economy has much more in the way of services—ranging from those performed by beauticians and barbers to those of teachers, insurance agents, and lawyers—than does the Soviet economy. Washington tends to include services in its comparisons while Moscow normally leaves them out.

There are many important production areas in which the Russians have narrowed the gap with the United States substantially, and some where Soviet output is actually ahead.

The brightest comparison for the Soviet Union is in machine tools. Last year's Soviet production of 154,000 machine tools was not only more than 3 times that of the United States but also 60 percent better than the U.S. record year of machine-tool production, 1952.

Steel provides the Russians with other comforting statistics. This year the Soviet Union will produce about 71 million metric tons of steel, about 80 percent of the expected U.S. output.

There are commodities in which Moscow refuses to compete, notably automobiles. U.S. production of automobiles in 1 good week has usually in the recent past been equal to normal Soviet output in an entire year. Similar though less extreme comparisons hold for goods such as television sets, refrigerators, and the like.

THE CHRISTIAN SCIENCE MONITOR,
Boston, Mass., November 1, 1961.

Mr. J. G. SOURWINE,
Chief Counsel, Internal Security Subcommittee, U.S. Senate, Washington, D.C.

DEAR MR. SOURWINE: Thank you for your letter enclosing the testimony by Mr. Gwyer in which he mentions his contacts with me, and thank Senator Keating also for the opportunity to comment.

Mr. Gwyer has correctly stated the relationship, and I have nothing to add. His material was thorough to the point of being exhaustive, but it was not firsthand. It was a researchist's work, and did not stack up with the firsthand reports which were given me by businessmen who had actually seen Soviet

machine tools at work. So I accepted the firsthand reports since they were from competent men, and offered to state Mr. Gwyer's total disagreement and use some of his points in disagreement. However, he seemed to feel this would compromise him and asked me to eliminate his name altogether from the article, which I did. I am enclosing my correspondence with him, which I would like to have returned after it has served any purpose useful to you. I have also attached the article in question with the authorities italicized from whom I drew my material.

Sincerely,

NATE WHITE,
Business and Financial Editor.

Mr. White's article, "Tooling for Communism," was published on the first page of the second section of the Monitor's edition of January 31, 1961. He introduced it in part as follows:

"World communism increasingly is machine made.

"The Soviet Union exports machines to countries which need machines. And it attempts to export communism with the machines.

"This is the most significant threat to the free societies in the Soviet machine-tool industry.

"Some Western experts scoff at the Soviet machine-tool industry. 'They can only produce pliers and monkey wrenches,' said one production man. But this view is not supported by the preponderant evidence, largely assembled by several teams of U.S. experts in different industries who have visited Soviet industrial plants."

* * * * * * *

Among those quoted was Benjamin C. Buerk, president of the Buerk Tool & Machine Corp., Buffalo, N.Y., who visited the Soviet Union in August 1959. Mr. Buerk said in part:

"The most impressive plant was the Krasny Proletary Works in Moscow, builders of machine tools, specializing in the manufacturing of engine lathes on a production-line basis. Here we saw the use of automation in the production of a lathe with about a 16-inch swing, made in various bed lengths. The major components such as the bed, headstock, and carriage are produced at a series of machining stations with automatic transfer mechanisms between each station. * * *

"This is an interesting example of the application of automation techniques in the manufacture of machine tools. Nothing I know of in this country compares with it. * * *

"We saw other instances of mass production applied to such things as the manufacturing of ball bearings, for example. We also visited two plants which manufacture heavy equipment such as large turbo and hydroelectric generators for power stations, large electric motors, huge steam turbines, and similar equipment.

* * * * * * *

"At the U.S.S.R. Exhibit of Economic Achievement in Moscow, we saw an exhibit of machine tools, I was frankly surprised to see examples of advanced development in such things as electrochemical discharge machines, automatic grinding machines, and numerical control."

Mr. White cited a "recent" study by Franz Wolff-Cammaerts, secretary-general of the European Committee for Cooperation of Machine Tool Industries. This official estimated that the 1953 total machine-tool production of the U.S.S.R., East Germany, Czechoslovakia, Hungary, and Poland at 29.9 percent of the total world production. Of this production 20 percent was for export.

It is certainly true, Mr. White added, that the United States and Canada, accounting for 23.8 percent of the total world output, and Great Britain and non-Communist Europe with 39.9 percent of the world output, provide a vigorous world competition for the Communist bloc.

* * * * * * *

Three other Americans who visited Russia were quoted in Mr. White's article.

"We saw generator and turbine plants in Leningrad, ball-bearing and machine-tool plants in Moscow, also their first atomic-energy plant for power development," *John R. Campbell*, consulting engineer of *Rutherford Campbell Engineers, Inc.*, Buffalo, N.Y., tells The Christian Science Monitor. "The industrial plants we saw were quite up to date and efficient."

"I got the feeling (in a woolen mill in Moscow) that they had their workers driven to fever pitch and managed to get the most possible out of them by keep-

ing them at this zealous, competitive level. Their equipment was bad and inefficient, much of it obviously confiscated in Germany at the close of the war," reported *Frank King*, manager of the women's division of *Pendleton Woolen Mills*, Portland, Oreg., "Their quality was poor. * * *"

J. L. Singleton, senior vice president of Allis-Chalmers Manufacturing Co., reported: "I visited plants which manufacture transformers, steam turbines, hydraulic turbines and electrical rotating equipment such as generators and motors. I must say that the Soviets are making a tremendous effort, but at the same time I was impressed with the great odds under which they are working. I felt that they were doing a commendable job in hydraulic turbines but otherwise their products could not be sold in this country on a competitive basis.

"In their factories I saw no innovations in machine tools and practically no electronic controls as we know them in this country. As a matter of fact, for the most part, the machine tools I saw were other than Soviet manufacture. In one plant concerned with the manufacture of steam turbine blades they are still using American-made machine tools marked 'war finish' that were furnished by us during Lend-Lease. * * *"

To *Nevin L. Bean*, technical assistant to the general manager of the automatic transmission division of Ford Motor Co., the story is quite different, Mr. White wrote.

"In an interview in his office at Ford's Plymouth, Mich., division, Mr. Bean expressed his concern that complacency would blind the people of the United States to the Soviet industrial threat," Mr. White said. "Mr. Bean, accompanied by *A. C. Hall*, vice president for engineering of the *Martin Co.* and *Weldon Brandt* of Westinghouse Electric, visited the Soviet Union in 1955 and was host to a return group of Soviet engineers. Through various sources he has kept himself abreast of the Soviet machine-tool production.

"While he felt that Soviet plants and standards did not measure up to U.S. systems, Mr. Bean saw enough of Soviet production to warn that the U.S.S.R. would make "giant production strides," expecting that by 1965 "many of their production facilities will be comparable to ours." Mr. Bean felt that the U.S.S.R. engineers showed "a high quality potential" in machine tools, production techniques, and engineering know-how.

"In the recent interview Mr. Bean told this writer that he felt the Soviets had come abreast of U.S. production techniques in many fields, and that it would be foolhardy for westerners to assume that the people of the U.S.S.R. were standing still.

"Mr. Bean reports as follows on the Ordzhonokidze Machine Building Plant in Moscow: "The plant specializes in building machine tools for boring. Tools old, but in good shape, much equipment of American manufacture including gear grinders, turning equipment, etc. * * *"

Mr. Hall said that, at the Experimental Scientific Research Institute Machine Building, Moscow, "among the machines that they showed us that were particularly interesting were: a gear-grinding machine, somewhat similar to a Gleason—very well designed and built; an automatic balancing machine for rotors for a variety of sizes—worked very satisfactorily; an electroerosion machine which produced a piece accurate to one-half millimeter."

Mr. White also drew upon the American Machinist/Metalworking magazine, a McGraw-Hill publication, for some statistical information and he quoted Mr. H. H. Whitmore, executive vice president of Jones & Lamson Co., machine-tool builders of Springfield, Vt., regarding prospects for future competition from the Soviet countries.

AMERICAN MACHINIST,
New York, N.Y., November 10, 1961.

Mr. J. G. SOURWINE,
Chief Counsel, Internal Security Subcommittee,
U.S. Senate, Washington, D.C.

DEAR MR. SOURWINE: Glen Bayless of our Washington bureau has sent to me your letter of October 30 offering us the opportunity to make any statements that we may wish before your committee pertaining to the recent testimony by Joseph Gwyer.

Though I am perfectly willing to testify, if the committee so desires, I believe that I can save the time of the members, and yours, too, by asking you to read and put into the record the attachments to this letter.

Mr. Gwyer exhibited to the committee and commented critically on a series of articles written by Norman Stubbs and Peter Trippe and published in Metal-

working Production, McGraw-Hill's publication in London. The series appraised the status of Soviet Russia's machine tool industry. Mr. Gwyer said that my own magazine, American Machinist, had printed this series, too.

When Mr. Gwyer made this statement he apparently was not aware that, prior to publication in American Machinist, the original articles had been completely rewritten and substantially cut in length, with personal opinions deleted and the facts and technical observations retained. I am attaching, and asking you to read and put into the record of the committee, a reprint of the articles as we published them in American Machinist.

To our best knowledge this series in American Machinist was the first printed in this country describing the size, scope, and the general setup and organization of the Russian machine tool industry. We believe now, as we believed then, that this series in American Machinist was an accurate appraisal, including the pluses and minuses. Our findings, as recorded in this series, have been substantiated by both American and European industrialists and trained observers who have visited Russia.

Mr. Gwyer, in his testimony before the committee, indicated that Russia's machine tool performance might have been overstated. I am attaching, and asking you to read and put into the record of the committee, an article that we published in the October 16, 1961, issue of American Machinist giving the world production of machine tools in the calendar year 1960.

The source of our figures in this article is the office in Brussels of the secretary-general of the European Committee for the Cooperation of the Machine Tool Industries. This committee represents the combined machine tool industries of all our West European allies.

The figures disclose that Russian production of machine tools attained a new peak at 183,500 units, compared with 160,000 in 1959 and 152,000 in 1958. Our American industry built only 34,000 machines in 1960. The figures also disclose that the Communist countries, headed by Russia and including China, built more than 1 million machine tools in the 3 years of 1958, 1959, and 1960. This total is larger than the output of our own American machine tool industry from the end of World War II up to now.

Over many years we have published in American Machinist many articles reporting the plans, technical developments, and performance of Russia's metalworking industry. If you think that your committee would be interested in reading these articles and having them put into your record, I shall be glad to send them to you.

I hope very much that this letter and the attachments will be of help to you and the committee in your deliberations.

Sincerely,

BURNHAM FINNEY, *Editor.*

[Reprinted from American Machinist, Nov. 19, 1956, to May 6, 1957]

REPORT ON RUSSIA

PART 1 FROM REVOLUTION TO AUTOMATION IN 37 YEARS

Moscow.—Automation and still more automation is the front-runner in the impressive upward surge in Soviet Russia's production and in its technology.

This young nation that 25 years ago had no machine tools is coming up fast in the race for world leadership in metalworking. What's happening in manufacture of aircraft, agricultural machinery, automobiles, machine tools, and heavy capital equipment of all kinds is convincing evidence that the Russians have been working around the clock to industrialize as fast as possible what has been, and to a great extent still is, an agrarian nation.

The U.S.S.R. has just completed its fifth 5-year plan. Its industrial expansion goal, a very ambitious one, was attained ahead of schedule. Russia is now in the early stages of its sixth 5-year plan, which spells out a further massive expansion of industrial facilities by 1960.

In order to understand better and appreciate more fully the vast significance of what is going on in Russia's metalworking industries—its amazing development up to now, and what is likely to happen in the years ahead—one must bear in mind exactly what kind of a job faces the Soviet leaders.

Russia, as an industrial nation, is unique. Its Government has to administer an area of more than 8½-million square miles—three times the area of the United States, four times that of all the countries of Western Europe put to-

gether, and covering one-sixth of the inhabited land surface of the earth, Russia has more than 200 million inhabitants, and the birth rate is increasing.

Less than four decades ago, at the time of the revolution (1918), the great mass of the Russian people was illiterate. In fact, some of the remote national groups that were to make up the U.S.S.R. had no written language at all. Against this, Russia had always had a nucleus of pure and applied scientists (notably mathematicians) of world renown. No industrial development would have been possible without that nucleus.

Those are the basic facts we must know if we are to appreciate both the achievements and the shortcomings of today's Soviet industrial expansion.

It is, for instance, clearly more realistic to consider Soviet industrial development in terms of rate of progress rather than judge figures for production of capital equipment, heavy industry, and so on, at their face value. The latter are impressive, it cannot be denied. But the rate of development is staggering when it is appreciated that the present-day program has been built up in a handful of years from a predominantly peasant population with no technological knowledge.

Shortcomings are evident, too

That there are many shortcomings cannot be doubted—some of them are there for all to see. Even in Moscow itself, once one leaves the hotel, houses of extremely low standard are evident, and, during a car trip a bit further out, we noted that the large new building projects were soon replaced by evidence of even lower living conditions—approaching squalor—with some wooden shacks in the most dilapidated condition. Many houses also were in a bad state of repair.

Against this, there are new groups of multiple-unit houses going up; but even these (or at least, those we have seen to date) have sheet metal roofing. Whether this is typical or not, it is impossible to say in this introductory report, and it would not be fair to judge by the evidence of a single short tour outside Moscow. Neither does housing yet seem to be ideal even for the higher executive.

For what it is worth, we quote an American visitor who was in Moscow at the same time as ourselves. He told us that he had visited the director of a works in Leningrad with his son, and was astonished to find him living with his family in only a two-room apartment. Clearly the pressure of the program has caused hardships. Clearly, also, it has achieved spectacular results.

Moscow is a city of contrasts. One of the most impressive sights in the city, for instance, is the 500-acre United Soviet Agricultural and Industrial Exhibition. In this permanent display, the Soviet has a strong morale booster. Here is a remarkable presentation of the best of Russia's achievements. And, above all, the exhibition serves as a cultural center in which the many nationalities and types of people represented in the U.S.S.R. can meet with each other.

Here, too, they can study the latest methods, techniques, and products. Engineering equipment is proudly featured—with machine tools allocated a prominent and attractive "palace" to themselves.

There can be no doubting the value of this exhibition, and we shall be describing the exhibits in greater detail later on. The cost must have been fantastic—and with the appalling state of some of the living quarters in and around Moscow, one might well wonder what sacrifices paid for it.

In no other country we have visited have we seen anything quite like this great park, with its beautifully laid out grounds and, most important, the individual "palaces," many of which are in the characteristic style of the territory they represent. Each displays its products, indicates the scope and scale of its activities, and workers from the different states sent to Moscow on short study courses take in visits to the exhibition as part of the course. The display in the machine-tool palace is extensive and impressive.

Naturally, with the Soviet policy and power to implement rationalization, the competitive element as we know it is absent, although there was some evidence that lack of competition was compensated for by the enthusiasm it generated and inspired. It must be added, however, that such evidence is not very concrete. Certainly, everything possible is done to boost morale and stimulate keenness, and we met many people who had great confidence in "the system" and were working enthusiastically to further their own advancement both technically and academically.

Priority for heavy industry

Automation is literally at the forefront, not only at the machine tool palace, but, more significantly, in the present 5-year program. Soviet preoccupation with automation can, of course, be traced back to historical necessity—it is a natural development in building up a powerful industrial potential starting from a population which was entirely unskilled technically. Such conditions, we believe, make first for mechanization, secondly for automation in various forms, and finally for highly complex integrated lines—an entirely inevitable development.

The trend has been consistent and has grown progressively from the early days of Soviet industrial programs right up to the present time—forced by an inescapable necessity to "deskill" the work and put all the skill into the machine. This policy has clearly been an indispensable factor in attaining the present industrial output.

Automation is simply one more aspect of a fundamental principle that has been energetically pursued ever since the Soviet came into being. Throughout the history of the Soviet, it has been emphasized that the development of heavy industry is a prerequisite for raising the country's production forces and for transforming it into an economically powerful state.

To quote Marshal Bulganin in his report to the 20th Congress: "As hitherto, the leading role in the department of the socialist economy will be played by industry—primarily by heavy industry, the production of means of production." The latter phrase might well be taken as a slogan for the present 5-year plan—and, indeed, for those that preceded it. It is certainly evident in the figures for the plan itself. As far as implementation is concerned, it is also evident in the organizations, not only in factories themselves, but in the remarkable bodies set up for research and development in machine tools, cutting tools, instruments, and so on, of which we shall say more later.

At this stage, it is sufficient to say that, in our experience, these organizations are on a fantastic scale and are quite unlike anything we know in this country. It is also, of course, evident in Russia's technological training program.

No machine tools 25 years ago

Before appraising the problems to be overcome if the Soviet program is to be fulfilled, it is necessary once again to consider the Soviet machine tool industry in its proper historical setting, because, here too, it is only by appreciating the rate of development that the plan can be seen in its correct perspective.

One way of illustrating this is to consider the growth of a factory which we visited in Moscow. We are not in a position to compare this plant with others in the Soviet as we have not, at the time of writing this report, had the opportunity of visiting others, but its history of development is broadly the history of development of machine tools in the Soviet Union.

This plant, the Ordzonikidze machine tool factory, was built in 1930–32. This date is significant, for, previous to this, there had been virtually no machine-tool building in the Soviet at all. Thus, the present potential of capital equipment in the Soviet has been built up from scratch in only 25 years.

The Ordzonikidze plant employs 3,500 people. Initially, its activities were not confined to machine tools. The policy at first was deliberately to copy foreign machines in order to get into production quickly without having to call on design resources which were not available. Russia turned to America for the pattern: started building turret lathes of 65-millimeter bar capacity which were direct copies of a Warner & Swasey machine. In 1934 Ordzonikidze produced its first semiautomatic multitool lathe—a copy of the Fay automatic. In 1937 came the first multispindle automatic—a copy of the Cone machine.

With these machines as the base, Ordzonikidze built up experience in the shops and the design office. These were the only three types of machines made until the beginning of World War II when Russia modernized and improved tooling. War production, however, still remained on similar lines with some special types added.

After the war, some interruption was caused by need to reconstruct war-damaged factories but, this completed, Ordzonikidze introduced unit-head production machines. Ordzonikidze now makes 11 unit heads in different models and sizes, based on 3 types. In the same period (1946–48) the plant also did modernization and experimental work on its own automatics.

Production of automatics of original design and construction, in addition to semiautomatic machine tools, started in 1950–52. Power was increased and speeds raised. Design was considerably modernized, and features included constant cams and adjustable linkage, lifting of the drum when indexing, mechanized motor of the camshaft in setting, and mechanized swarf clearance. Semiautomatics now feature 60-kilowatt motors and maximum speed has been increased from 230 to 1,300 revolutions per minute. A smaller model has had its maximum speed raised from 320 to 1,300 revolutions per minute. One multitool machine we saw has 200 millimeter diameter capacity, with maximum speed of 2,000 revolutions per minute. It gives four automatic cycles, which the plant considers adequate.

We were told that six cycles would be considered too much, since it would indicate that too much metal was being removed. The latter point is of some interest. Such a practice comes under the category of "uneconomical usage," and is directly in line with the directive for the 5-year plan, wherein economy of metals is emphasized.

Machine tool designers are called upon to lighten machines as much as possible without impairing their operating efficiency and, in all industries where it is practicable, to look for substitute materials.

There is much skip turning on the smaller machines. Two automatic speed changes are provided. The actual feed is also constant in copying—that is to say: the geometric sum is constant, the vertical and horizontal feeds related.

The same plant is also making a special vertical boring machine for roller bearings, and has already built a large floor-plate boring machine which is now somewhat out of date but is in process of being redesigned.

Transfer machine major feature

Compared with the original three copies of 20 years ago, the major feature of Ordzonikidze production is now transfer machines, which have been in production since 1948. These are heavy machines. It was noted that the plant is today turning and grinding on its transfer lines, notably on pistons, rings, electrical motor shafts, and so forth. In turning rings and pistons, and also gears, vertical spindle elements are used.

Several machines were seen in course of construction, including a large duplex machine for cylinder heads in which substantial broadly based heads were provided for milling cuts, and in which provision was also made for manipulating the heads automatically, turning through 180°, and so on.

Another indication of the progress made by this plant in 22 years: initially it had 15 to 20 designers. Today, there are several separate design offices for different machines and, altogether, 400 designers and draftsmen are employed.

The shops are quite well laid out, with plenty of space in the aisles, but the assembly bay is cramped. The floor is firm, but again some sections of the assembly bay are not so good. Those concerned are aware that there is room for improvement and do not appear to be sensitive about it. The engineer we were talking to appreciated the point when we told him that we liked his machines but not his floor. They also have minor troubles with undesirable workshop practice, of a type, it should be said in fairness, with which we are not unfamiliar here. The same engineer grimaced when he saw that we had noticed a young fitter using a file as a punch.

In the plant itself, most of the items are imported—some are prewar and others wartime acquisitions. Very few of the machines we saw in this plant seemed to be postwar. Among those noted were two Butler planers and a whole battery of medium-sized Billeter & Klonz machines. There was a Kendall & Gent miller, a small Cincinnait (British built); a Beliot-Gray planer-miller (this was one of the few postwar machines); a fairly elderly large Giddings & Lewis floor-plate horizontal boring machine; Milwaukee millers; a Girards radial and a Wotan grinder.

Russian-built machine tools

But, lest it be thought that Ordzonikidze is entirely equipped with imported machines, it should be added that the Russians are also taking some of their own medicine. In the turret lathe section we noticed quite a few copies of Warner & Swasey machines, but we did not see any Russian-built copying lathes.

There are some important Russian machines in the plant, notably a large horizontal boring machine, built in Leningrad and of the very latest type; and a large and a medium sized planer—both looked good. The Soviet planer had a table 2½ meters by 10 meters. The borer had all electromechanical controls,

no handwheels, and amplidyne drive. In addition we saw a fairly new Soviet spiral bevel gear grinder and others for spur gears. There did not seem to be really anything out of the ordinary about this equipment but, on the whole, it was in pretty fair condition. We were told that a particular point was made of maintenance.

Tooling and methods in this plant were generally conventional, with emphasis on carbide tooling. Although ceramics were noted elsewhere, there were none here. A homemade induction heater was in use for hardening gear teeth.

As far as the rate of working was concerned, there was certainly no rush and tear about the place and, unless efficiency deceived, one would say that the pace was not as fast as in the best British and American shops.

As one of the founder machine tool factories in the Soviet, this plant has consistently developed along a typical pattern and is geared to take its place in providing machine tools based on up-to-date design principles which will doubtless play their part in implementing the 5-year plan.

PART 2. RUSSIA'S SIXTH 5-YEAR PLAN

Moscow.—Soviet Russia has every intention of usurping the United States' dominant lead in world production and technology by 1960, when the U.S.S.R.'s just-begun sixth 5-year plan will end.

The new plan calls for an even more intensive industrial and economic development program than the fifth 5-year plan, which, according to Russia's own official figures, chalked up this impressive record in the years 1950 through 1955:

Industrial output increased by 85 percent.

"Production of the means of production" increased by 91 percent.

Total metalworking output increased by 220 percent.

And Russia's industrial production increased 220 percent in the years 1940 to 1955.

In still another field, Russia intends to build mechanized automatic rolling mills of types comparable to the world's best.

Russia urgently needs to economize on metal. This is borne out not only by plans to greatly increase iron and steel output, but by specific instructions aimed at the machine tool designer.

Russia still has far too many old lathes, most of them totally inadequate for modern turning. For example, some of them have spindle speeds of only 150 to 400 revolutions per minute. But at Ordzonikidze new types of lathes are being built with speeds up to 2,000 revolutions per minute.

Lacking, too, are enough automatics and semiautomatics, boring, gear-cutting, grinding, forging, and stamping machines. And foundry machines presently in use have only about one-third to one-fourth the capacity of modern equipment.

To quote from the directive for the sixth 5-year plan, "In designing and producing lathes, machines, and equipment, the machine builders must pay particular attention to lowering expenditure of metal by improving designs, using economical rolled shapes, and replacing metal with plastics."

Russia's instrument manufacturing and electronic industries will come in for a good deal of attention. To provide sufficient quantities of control equipment for automation, Russia is scheduled to build 32 specialized instrument plants within the next 5 years. Research and laboratory facilities will be enlarged, doubtless to allow for increased production of computing equipment. Look for Russia to adopt the principles of numerical control on a large scale.

Modernization of existing machine tools will be a big factor in the program. The Russian Government has often implied that its plants have to build too many of their own fixtures and gages, with insufficient help from machine tool builders. That situation will be corrected by a special department of Russia's major developmental organization, ENIMS.

Automation will play a vital role in Russia's forthcoming industrial boom. As Bulganin himself said in a recent speech, "the economic effect of automation in engineering works is high. Our up-to-date production lines make it possible to reduce the number of workers to between approximately one-fifth and one-tenth of what it was, and to curtail working time in processing to the same extent."

Those gains are impressive by any standards, but the Russians still aren't satisfied with their industrial, technological, and economic progress. The sixth 5-year plan calls for an even greater effort to achieve Russia's goal of world industrial leadership.

Take for example production of machinery—the "production of the means of production"—that is the heart and soul of the program. This is planned to increase 70 percent by 1960. Compared with 1940, this means that the Soviet will have to increase machine production 560 percent over its 1940 quota. To accomplish this end, Russia is preparing to turn out an unprecedented quantity of modern machine tools, automation equipment and instruments, forging and stamping machines. Keeping pace will be tremendous expansions of electric power producing facilities, and of the iron and steel, oil, coal, and chemical industries.

Russia's Government is well aware that the country still has far too few machine tools. Last year, various engineering ministries were sharply criticized for holding up Russia's production potential. It is fully appreciated that the machine tool industry must keep well ahead of other industries. That is why an 80-percent increase in the output of machine tools is vital to the sixth 5-year plan.

To accomplish this, metalworking plants must be reequipped with the newest in lathes, forging and stamping machines, with foundry equipment, and with automatic and semiautomatic lines. Output of lathes, for example, will be almost doubled by 1960, comprising at least half the total output of machine tools during the next 5 years. Production of multitool lathes will increase nearly 150 percent, and output of automatic and semiautomatic lines and of automated equipment will go up nearly 400 percent.

More forming, stamping machines

A high priority will go to forging and stamping equipment under the sixth 5-year plan to achieve twice the production of this type of equipment, and to increase output of heavy presses by at least 300 percent by 1960. And precision forging will be more widely applied than before.

Output of modern foundry equipment, to replace manual operations and bull labor, is expected to increase by as much as 700 percent. Not only that, a large number of specialized foundries will be built in various parts of the country. It is hoped that a much higher output of precision castings will thus be obtained, thus saving both on metal and on subsequent machining operations.

"Automation must be widely employed in all industries. This task confronts the heavy and light industries alike. Automatic computing machines which can themselves determine the most advantageous regimen of production processes and maintain it, and also establish and control quality assignments, must play an important role in automation."

This would imply that Russia is deeply interested in applying numerical control to production. So far, it hasn't been determined whether the Soviet Union has gotten past the theoretical stage.

That brings up a pertinent question. Is Soviet research out of touch with industry? Even the Russian report to the 20th congress brings up the point, "A spirit of smug complacency and self-satisfaction has taken root in some scientific institutions. It would be a good thing if those institutions were swept by the fresh breezes of criticism and self-criticism, and if they went in more for creative discussion of scientific problems. This is the only way to eliminate the shortcomings which retard the development of science and, in particular, to put an end to the misguided tendency of certain scientists to act as the sole arbiters in their particular branches of science."

That is strong comment. It is, of course, not an exclusive Soviet problem.

Adverse comments to the contrary, though, Russia's scientists have succeeded in applying the principles of automation to the production of automobiles, trucks, electric motors, sewing machines, and many other metalworking products.

And there is an impressive solidity about the transfer machines now being built for large components. High rates of metal removal are being achieved in milling cuts on large cast iron components. The heads on these machines are standardized and of substantial construction.

In contrast with these heavy units, standardized unit heads are also available for high-speed operation on quite small parts, using rotary indexing machines with automatic feed of the components at the loading station. Step drilling of smaller diameter holes at high speed is featured, too.

There is no doubt that the Soviet has come a long way in developing these machines. An example of such advanced technique is the incorporation of turning and grinding stations on lines for pistons, rings, and armature shafts.

It should be appreciated that automation means much more than transfer machines to the Soviet. The latest trends show a serious endeavor to provide

flexibility in automated lines. An important trend in this respect is toward units with standard table heights that can be incorporated into a line as required, and the use of general-purpose machines with appropriate linking arrangements.

Russia plans during the next 5 years to bring into service not less than 220 automatic and semiautomatic lines and shops. In the radio and electronic fields, extensive mechanization of, and automation of production of standard parts will be carried out. It is also planned to automate assembly of electric motors.

Considerable specialization in the production of machines is called for, and it is clear that, up till now, there has been too much duplication. The engineering industry heads the list here. It is pointed out that many ministries and departments are manufacturing vital equipment entirely outside their fields of production, and that one and the same type of machine is being produced by several ministries or departments when it could more efficiently be centralized in one.

For instance, the Ministry of Agriculture has up till now been turning out about 10 percent of all the metalcutting machines, and 24 percent of all the forming machines and presses produced in the country. Such machines, in consequence, have often been obsolete technically and production cost has been high, because they have been made in comparatively small batches, and with insufficient technological knowledge.

Because of the present lack of specialized foundries, and forging machines and press factories, large quantities of castings, forgings, dies and fixtures, and other items in large-scale usage have had to be produced by individual plants, at high cost and poor quality. As already mentioned, improvements in foundry and metal-forming equipment are envisaged in the next 5 years to overcome this situation:

"The aim must be to have every enterprise producing technically uniform products, to standardize parts and units to the maximum, and to organize their mass production as specialized enterprises."

This is not to imply that the variety of equipment available to Russian industry will grow less; on the contrary, it envisages a growth of sizes and types of product; but these must then come under strict specialization of both design and production.

It is appreciated that Russian productivity has not increased in an adequate ratio to its technology, and that this is not solely the result of inadequate production planning and engineering, but is also a function of irrationalities in the system of output quotas and wage rates—a surprising admission.

Apart from the introduction of more modern machinery, Russian productivity in the next 5 years will be helped by the expansion program for power supply which, it is claimed, will increase the power per industrial worker by 60 percent.

The brief details in the foregoing major requirements called for in the present 5-year plan were taken largely as our basic terms of reference when discussing the situation with Soviet engineers.

In an interview with the Deputy Director of the Ministry of Machine Tools and Small Tools, it was confirmed that the figure of 250,000 tons of machine tools (the expected total Soviet output for 1956) is not, as first thought, totally inclusive.

Overall production is in fact more than double this figure, since it applies only to metal-cutting. Previously, there was some doubt as to whether this was so or whether the figure included forging machines and presses. It seems clear that these are not included and, in fact, forming and foundry machinery will amount to another 150,000 to 180,000 tons.

Emphasis on metal forming

We had confirmation, as envisaged in the report to the 20th Congress, that, during the present plan, the emphasis will be on metal-forming machines, and a senior member of the directorate of the Ministry of Machine Tools made it clear that it is looking to such machines to make a major contribution to increased productivity. One aim, as already mentioned, is to produce more close forgings, making the utmost use of automation.

Asked whether powder metal techniques were included in this category, the Deputy Minister told us that Russia is not looking for any major developments in that field, although powder metallurgy is being used to some extent for the production of tools. The lost wax process is also exploited where practicable. Incidentally, we saw evidence of this at the Moscow United Soviet Exhibition, notably for sewing machine parts.

Shell molding, we were informed, is being used only on a limited scale. Solid crankshafts have been cast by this method, but are not in general use. "Bakelite" sand mix—the word "Bakelite" is the actual term used—is considered too expensive yet to justify wider application.

The West's embargo on machine-tool shipments to the Soviet is decidely a thorn in Russia's side. Russia badly needs certain types of machine tools listed under the embargo, although officials claim it won't hold up the sixth 5-year plan.

The head of Russia's export-import organization made it plain, too, that the Western machine-tool makers, themselves, were not to blame. He had found them eager enough to sell their wares within the limits imposed by heavy order books. Some of them recalled the benefits of prewar sales, he said, and the Soviet could remain a big customer. West German firms in particular, would very much like to gain access again to the Russian market.

Asked whether the Russian aim was to become self-contained as far as the production of machine tools was concerned, he replied, "Not necessarily." Naturally the embargo has had a bearing on Russia's attitude and, embargo or no, the Soviet is continually broadening the spread of its products.

The expansion of machine tool production under the sixth plan by no means represents only increased output of current types. Here are figures quoted to indicate the revised shape of the program of types and sizes, according to plan. Figures relate to the end of the 5-year period.

	1950	1955	1960
Metal cutting	435	790	1,200
Presses, forming machines	99	240	500
Foundry and diecasting	25	50	120
Woodworking	111	156	159

Elephant machine tools are a feature of the Russians' building program too, and steps have been taken to insure that Russia can meet demand for these machines, to some extent at least, despite the ban. Asked what the maximum sizes are, the reply was, "Any size we may need." As a guide to the order of size of machines built to date these figures were quoted; a boring mill for work up to 18 meters diameter; a planer with a table 5 meters wide by 18 meters long; a center lathe with center height of 1½ meters—bed could be any length required. What capacity Russia has for producing these large machines was not revealed.

Even so, it was explained that the Soviet would very gladly have bought these machines from the West, and also other specialized types required in relatively small quantities, because it would have taken less cost and effort, he declared. Russia, for example, was not particularly anxious to build its own machines for producing marine reduction gears. The Russians clearly appreciated the considerable know-how involved, and they could probably have used the design and production capacity to better advantage.

But, by force of circumstances, the Russians had to introduce them into their program. Now the machines being turned out are capable of doing the job.

Import and export of machine tools are handled by a state organization, Stanko-Import, which has its headquarters in Moscow. It is very clear that the Russians would like to buy if the West would sell. However, the Russians seem fairly confident that, if the embargo continues to be applied, they will be able to meet many of their needs elsewhere.

In conversations with heads of Stanko-Import, we also discussed European machines and were told that deliveries of Hauser machines were good, but delivery was slow from Société Genevoise.

One unexpected discovery during our visit to Stanko-Import was that in spite of a shortage of machine tools, Stanko is prepared to export Soviet-built ones. Inconsistent though it may seem, we were told that Stanko would export standard types, and we were quoted prices on milling machines and horizontal boring and milling machines up to 200-min. diameter spindle.

Prices, we were informed, would be "adjusted according to competition." The head of the organization, who gave us this information, added that he would be no more specific than to add that "they were also businessmen."

We could obtain no figure for the volume of machines which Russia would be prepared to export. Asked whether the U.S.S.R. would be prepared to license its designs, he admitted that it is a possibility. Prestige is obviously one factor behind the decision to export, and, doubtless, a competitive element.

Among a complete set of catalogs, in categories, which we obtained from Stanko-Import, is a well-produced publication in English listing Soviet gear cutting machines. This includes gear shapers, straight bevel gear generators, spiral and hypoid bevel gear generators, gear hobbing machines, horizontal gear cutters, gear tooth chamfering machines, gear shavers, gear testing machines, spline hobbers, gear grinders, thread millers, thread grinders, and nut tapping machines.

The introduction to the catalog is worth quoting: "Machine tools produced in the U.S.S.R. are outstanding for their high efficiency, convenience, and safety in operation and long service. The first class material, perfect modern design, and skillful workmanship provide accuracy, high efficiency, and durability of the machine tools. Steady improvement of machine-tool design in the U.S.S.R. aims at the increase of productivity, accuracy, reliability, and dependability of machine in operation, as well as the reduction of operator's fatigue by improving and convenient placing of all operating controls and the all-increasing automatization of operation. Stanko-Import is able to offer a wide range of machine tools both universal and special types, including automatic transfer machines and automatic workshops."

PART E. RESEARCH AND TRAINING

As indicated earlier, research organizations in the Soviet are on an enormous scale. The main machine-tool research organization, ENIMS, for instance, employs no less than 1,000 scientific workers, plus 1,000-or-so nonscientific workers in the adjoining and associated development works—and this organization is solely concerned with metal-cutting machinery. There are other institutes, not so large, which deal with metal-forming machinery, abrasives, and cutting tools. Approximately 2,500 to 3,000 people are employed in them.

Twenty-five-year-old ENIMS is the center for machine-tool development. Ideas are fed both ways, from the research organization outward and from plants in to the organization. A good deal of autonomy is granted to firms in building up their own design staffs; but all ideas must be submitted to the Ministry of Machine Tools at a fairly early stage for consideration by a council. All universal machine projects must be approved by the Ministry.

Experimental research setup

The experimental works, where prototypes and development are carried out, is directly under the director, as are the scientific board and engineering board. Two main sections under the deputy director are the responsibility of the assistant chief engineer, who is responsible for engineering research, and the chief designer. Subsections under research include general research, electrical hydraulic, automation, machining methods, metallurgy in relation to machine tools, and units and mechanisms. On the design side are sections for lathes, automatics, and milling and planing. The grinding section is again subdivided to include plain and universal grinding, surface grinding, polishing and honing, and so on. A section for gearcutting research includes sections for production of spur gears, bevel gears, a research laboratory, and a modernization bureau.

The present trend toward automation of Soviet industry goes much further than the already plentiful supply of highly complex linear and rotary indexing machines. A whole range of so-called standard machines is being developed, which can be dropped, as it were, into an automated line at will. These machines are one of the important projects at the ENIMS metal-cutting research organization in Moscow; prototypes are being built at the Stanko-Konstructia plant, said to be in Leningrad.

All machines in the standard range are built with uniform table heights, so that they can be readily linked together to form an automated line. And they have special design features that cover handling through each machine's cycle, from picking up through the cycle of operations to ejection of the finished part.

This trend is obviously not only going to make it a great deal easier to build up automated lines, but will also offer flexibility and open the way for automated lines in operations where a special transfer machine would not previously have been justified.

Among machines of this type either in production or in development are a gear hobber with adjustable vertical column and overarm to suit flow and loading of line; a two-spindle copy miller; a vertical lathe with magnetic lifting of work and pneumatic loading; a centerless grinder with friction-type feed tube; a gear shaver; an automatic grinder with automatic loading and size checking; a spline-broaching machine; and a dynamic balancing machine with automatic correction by drilling.

The All-Union Cutting Tool Institute is a separate organization set up in 1944 to design tools and test for the tool industries and plants. It operates broadly on the same principle as ENIMS. There are three main branches. Of these, the design department has three sections, or laboratories, which carry out research into standard techniques, tools for automation, and gearcutting tools.

The second department is technological and deals with special problems relating to production of tools, including machinability by standard techniques, welding of tools, foundry tools, shaping, and application of carbide tips.

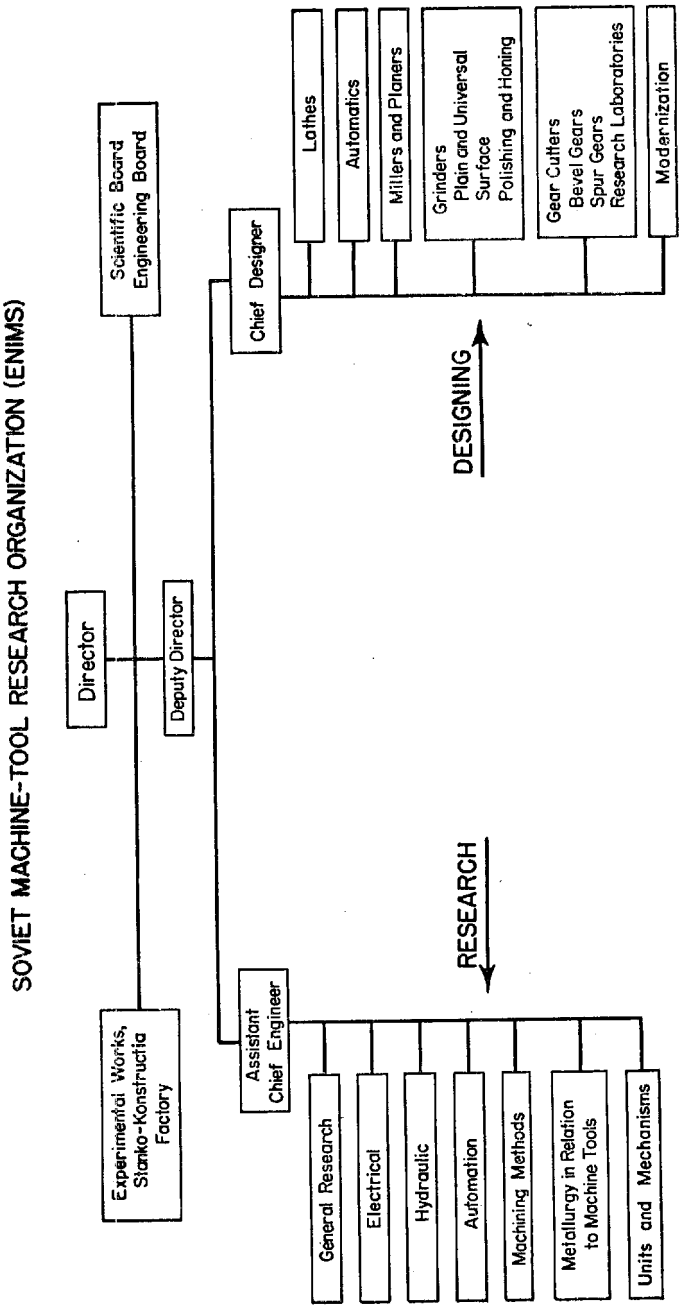
The third is a metallurgical department with mechanical, physical, chemical, heat treatment, high-frequency heating, and metallography laboratories.

A special laboratory is engaged in machinability and cutting-tool tests. Other engineering departments include standardization, economy, and organization of tool production. The institute is also responsible for technical information and published work, and gives technical help to factories. In addition, there are an experimental plant, a measuring laboratory, and another laboratory for the use of radioactive elements.

Briefly, the main terms of reference for the cutting tool institute are as follows: design of tools, development of technical problems of production, investigation of cutting problems, testing of cutting tools, and standardization.

Factories compete for skilled labor

In a Moscow factory we visited, shift work was in force, but the management admitted needing far more workers than it could get. At present, the plant is advertising for labor, and there is plenty of competition for the worker.



Workers are divided into eight categories of skill and qualifications, the qualification being determined by test. Periodically all workers must go through a special course to bring them up to date, these courses being organized by trades. Initially, workers come from special schools or classes which they can enter after 10 years at other normal schools.

The first year at these is spent at the school and the second at the works. During these 2 years, basic information is provided on theory of metals, drawing, estimation, and so forth, the syllabus depending on the work which the youth will take up subsequently. Large works have their own associated schools.

Some workers may still come through without having attended the special school. In this case the works provides instructors and basic theoretical information required for the job.

Typical wages are those of fourth-degree workers, who average about 980 to 1,000 rubles a month. The sixth-degree worker takes home about 1,200 to 1,300 rubles.

Pay is on a piecework basis, but bonus incentives can also be employed. Engineers come from technical institutes and schools. Mainly, they work in the shops for 2 to 3 years. Workers with high qualifications can go to evening schools, technical colleges, or high schools. Of the 3,500 workers at the Moscow plant we visited, 200 were engaged in further education of this kind. Ages of these students vary from 20 to 50.

One aspect of the competition for labor is that it is leading to construction of housing accommodation by factories seeking labor. Once built, housing is handed over to the local soviet.

Engineers are represented by a society of engineers, which is divided into sections covering all branches of engineering, such as mechanical, production, electrical, and so on.

A study of directives and reports on the sixth 5-year plan indicates that the Soviet is well aware of the need for higher labor productivity and better management. The improvements envisaged will affect certain aspects of wage earning.

Output geared to wages

Present practice is often to make output quotas correspond to a definite wage level, and not to technical and efficiency levels already achieved. The plan demands that order should be brought into the system of wage rates in industry without delay so that technically substantiated output quotas can be introduced on a mass scale.

It is also admitted that there are wide discrepancies in the payment to workers in the same trade, and often even in the same locality. Considerable improvement is also called for in existing systems of payment for engineers, technicians, and economic executives.

It is planned that part of the remuneration received by this category should be strictly dependent on the basic performance indices of the enterprise concerned. Briefly, to quote the report; "We are faced with the very important and urgent task; to put in order the system of fixing rates and payments for factory workers and engineering personnel."

Other plans that will affect labor during the next 5 years include (1) raising the wages of the lower income categories of workers, (2) going over beginning in 1957 to a 7-hour working day and (3) reducing the working day on Saturday. Working day for workers between 16 and 18 is to be reestablished at 6 hours.

Further development of education is looked upon as one of the key problems. In addition to secondary schools, both general and specialized, there will be further expansion of correspondence and evening courses. During the current plan, 6.3 million students will complete secondary schooling.

Room for improvement

Development of polytechnical training in the general school has not been adequate so far, and the plan calls for improvement. There are also extensive plans to increase training of specialists. At present the Soviet employs 5.5 million in this category. In the current period, it is planned that no less than 4 million specialists will be trained in the higher and specialized secondary schools. This is nearly as much as in the two previous 5-year periods combined.

It is interesting to note the breadth of education the Soviet is calling for in its specialists. This is clearly indicated in Bulganin's report; "Economic and cultural development requires a marked improvement in the training of special-

ists; they must be conversant with the latest achievements of Soviet and foreign research and engineering. What is needed is a much more intimate combination of theoretical and practical knowledge of production."

PART 4. RUSSIA'S "AUTOMATIC FACTORY"

Moscow.—Russia has in full production 2 automatic lines for manufacture of 1.5 million bearings a year in a plant in this city. Facilities are available for making 900,000 ball bearings and 600,000 tapered roller bearings a year without the use of a single human operator.

These fully automated production lines are each an integrated manufacturing unit, having been converted by the Russians from what previously was a semi-automatic operation. They are part of a plant that turns out more than 1,000 types of bearings in sizes from 1.18 to 63 inches in diameter, weighing from 300 grams to 4.5 tons. The bearings are made to international sizes.

The automatic lines, from the plant director down to the cleaner, require only 178 workers on 2 shifts, or 89 men a shift. These workers, who include all maintenance men and electricians, control the automatic instruments and keep in repair more than 600 types of special machines or machining units, which embrace 127 main units. These main units consist of 70 metal-cutting machines, a small number of presses for marking and other purposes, and 50 grinding machines (as segregated from other metal-cutting machines).

Half the workers, one-ninth the time

Previous semi-automatic production lines, though highly automated, took nearly twice as many workers. More than that, the entire production cycle consumes one one-ninth of the time that it did. The reason is simple: there is no human intervention from the time of receipt of the rough tube from which the rings are made until the wrapped and labeled cartons come out the other end.

The whole Moscow line has been planned on a basis of segmented automation, using buffer storage hoppers. This setup not only overcomes varying production times for different operations—it also allows buildup of stocks for each section to keep machines supplied in the event of a breakdown of any preceding part of the line.

The ball and roller bearing production lines, in a plant 394 feet long with two bays, occupy an area of about 21,526 square feet. The project took only 6 months on the drawing board. Building and installing the machines and actually getting into production added only 18 months more. Each of the two lines, one for ball bearings and the other for roller bearings, runs through four main sections—turning, heat-treating, grinding and assembly.

A number of advanced techniques are used. The heat-treating cycle includes deep freeze. Centerless grinding methods have been adapted to internal grinding—for ball-bearing track forms as well as for roller-bearing bores and taper races. Centerless superfinishing with rubber wheels is also employed.

By using new techniques internally and externally for taper races, the Russians claim they improve mutual accuracy between the inner and outer track. And, contrary to expectations, centerless grinding of ball raceways and grooves has achieved much greater accuracy.

The method of superfinishing with a rubber wheel achieves metal removal of not more than 10 to 20 microns from internal surfaces of roller bearings for an exceptional surface finish of grade 9v–10a on the Soviet scale, which ranges from grade 1 to grade 14—the highest finish obtainable. In general, the accuracy limits are comparable to those of top bearing plants in the West.

Once the Russians decided to make bearing manufacture fully automatic, the project proceeded with tremendous speed. The reason for the short cycle is that the Government gave top priority to the project.

All available organizations—design and research bureaus, machine-tool makers, and the project's own design staff—were focused in a concerted effort. Design and engineering staff of the plant itself numbers among the hundreds.

And in Russia it is a much simpler matter to standardize than it is under our own system of free enterprise. Thus orders for special machines can be spread through the entire machine tool building industry—and each machine tool plant has facilities for making specials. Widespread standardization insures that all machines, irrespective of where they are made, can largely be made from standard parts at a minimum cost in a short leadtime.

In the Moscow plant, mechanization and automation has gone on for 5 years, and an even more ambitious program is scheduled for the next 5 years. Technical development is along three lines: Designing and creating new automatic lines, modernizing existing processes and machines, and converting semiautomatic operation to fully automatic, integrated production units.

Questioned as to whether a line as completely integrated as the Moscow bearing one doesn't offset its advantages by a loss of flexibility, Moscow plant engineers said that this had been allowed for in the planning stage—that every machine tool in the line has been designed to accommodate work 15 percent larger or smaller than that for which it was developed. This gives the line a 30-percent overall flexibility with no major alterations other than resetting.

Is a fully automatic line worth the trouble? The Russians' unanimous answer—yes. Primarily, this Moscow bearing line is regarded as just a beginning, not the ultimate. The experience gained in building it will be followed in building new lines that can produce other types of bearings with even higher degrees of accuracy. And when the right time comes, the machines in the Moscow line could be transferred to other, not fully mechanized plants. In fact, this year-old plant is already considered by the Russians to be out of date. This goes a long way to explain the success of Russian production.

Proof that the Russians are sincere in regarding the Moscow line as just a stepping-off point is that they placed no restrictions on technical details nor on photographs, such evidence that they figure if Western plants copy the line, Russia by that time will be well into far more advanced techniques.

Maintenance does not provide the complications which might be expected. Centralized control immediately indicates any failure. Most control equipment is electromechanical and numerical control is not used, although the Russians may one day use it.

How the line works

In considering the Moscow bearing line, it has often been reported in the Western press that it and similar lines are merely showpieces. To believe this is dangerous and a serious underestimation of Soviet abilities. This line is no showpiece—it is a realistic, practical working unit, and it is the shape of things to come. Its many new techniques have been developed on principles tested and proved in Western plants.

Now to the operational details: The Moscow lines make the rings and assemble two standard series of ball and roller bearings. Balls, rollers, and cages are made elsewhere. The building is not new, and the present layout is hampered by longer conveyor runs than would be needed in a tailored-to-fit building. But the plant is well lit, is adequately heated in winter, air-conditioned in the summer. Floors are clean, with all swarf carried underground.

The entire plant is centrally controlled by the dispatcher's desk. Indicating signals show which processes are operative, which nonoperative, and which are under maintenance. Meters show the number of rings that have passed through each section on each shift and for the entire month. The same is true for assembled bearings. Number and types of rejects are also indicated.

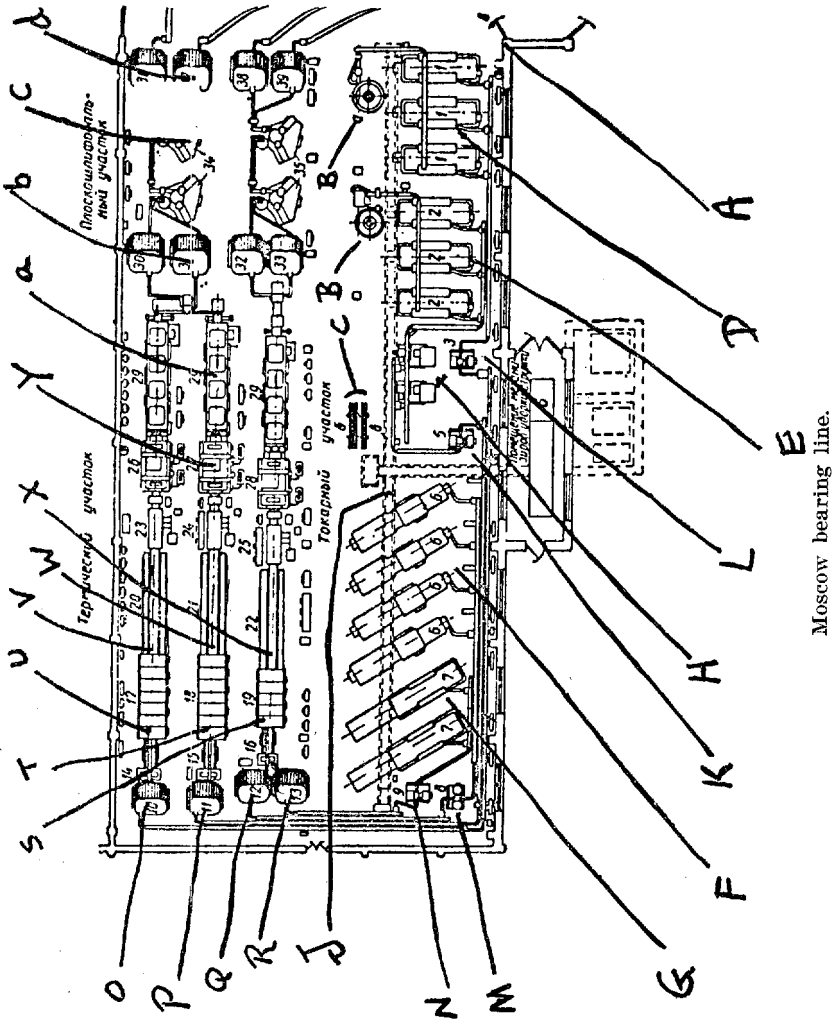
Centralized installations are employed by swarf removal, refrigeration for heat treatment, cooling liquids, washing fluids, etc. Ancillary services include a repair shop, tool crib, and a grinding wheel and abrasive maintenance section. Not a single operator is to be seen on the line.

Rough tube stock and rings come in through doors in the center of the long wall (see (A) on plant layout), are delivered to hoppers (B) and storage (C), preparatory to turning operations. For taper rings, the raw material comes in rings which are loaded into hoppers to feed the automatic lathes.

The hoppers have conical rotating floors and are so designed that blanks are orientated for conveying to the lathes. Each hopper carries 250 to 300 chrome steel blanks, which are picked up by an enclosed distributing conveyor (fig. 1).* A vertical flight takes them above the level of the lathes, then in a short horizontal run to the main feeder for the turning section battery of six lathes (D) and (E).

Ball bearing rings are turned from tube stock on another battery of bar automatics (F) and (G). Lathes for turning the taper rings are all basically similar in design. Three turn inner rings, three turn outers. Each lathe is a duplex 8-spindle model with a spindle at each end, is center-loaded. Of the four spindles at each head, one is a loading station, two are work stations, and the fourth is a transfer station.

*EDITOR'S NOTE.—Numbered illustrations are not published in this document since the textual matter alone serves adequately for purposes of comparison.



Moscow bearing line.

Blank is received from the first head by means of a special loading and transfer arm (fig. 2), mounted on a rugged overarm. It moves between the two heads, loading blank into the first head and transferring it after machining to the head at the opposite end—and finally feeding the machined component to a conveyor.

Then the OD is turned from the longitudinal slide and the end face is surfaced from the cross slide, and a chamfer put on the bore. Next, a button tool finish-turns the OD from the longitudinal slide, and more chamfering and forming are done with a single tool that feeds in longitudinally, and by a radius cutter and button tool on the cross slide.

Work moves across to the opposite head and is loaded (fig. 2). It is then held on the OD and a button tool on an angular slide turns the taper form for the race, while a second tool on the cross slide surfaces the end face. Then two tools on the taper angle finish turn the track and chamfer the lip of the bore while a radius tool turns the face.

The external taper rings are then unloaded onto a conveyor. They are turned by three of the six machines, the others turn internal taper rings in an operation similar to that for the external rings. Final operations on the external surfaces for the inner taper ring are carried out on two single-spindle automatics (H) that have the same operational cycle. Their major operation—finish turning the race—is done from the rear slide by a 1.18-inch wide adjustable tangential-action cutter and covers the whole surface of the track. Cutting speed is 393.6 feet per minute. The same slide carries two tools for facing the OD of the flanges, while four other tools (two in the top slide, two in the front slide) carry out grooving and chamfering. Operating time is 7 seconds per piece. Spindle does not stop for loading and unloading.

Carbide tooling is used throughout, but because average tool life is only 4 hours, special methods have been evolved to cut idle time: holders are held by the cutting force, require no clamps; a simple tool presetting method allows direct mounting on the machine with no further adjustment—to a consistent accuracy of 0.0008 to 0.0012 inch. Time needed to change 16 cutters is only 12 minutes.

Tool life is prolonged by efficient chip breaking, which involves controlling the chip form as it is produced, imparting a movement to the tool-holder to facilitate chip-breaking, and crushing the swarf in the machine. A central coolant system supplies the entire plant. Swarf disposal is done with underground conveyors that feed into a main trunk conveyor (J) that takes it outside.

By comparison with the taper rings, methods for turning ball bearing rings are more or less conventional and do not warrant description. The outer rings are turned on a bank of four two-spindle automatics (F), while the inners are turned complete on two six-spindle automatics (G).

All inner and outer rings for taper and ball bearings are marked after turning. Outer taper rings are conveyed directly from the duplex automatics to one of four automatic marking machines (L), other taper rings come directly from secondary turning operations on lathes (H) to the unit (K), while ball bearing inner and outer rings go from automatics (F and G) to marking units (M and N).

The marking head is horizontally mounted (fig. 3), and a six-station indexing disk is mounted on a vertical axis. As an empty station comes opposite the incoming conveyor, a ring drops into position in the indexing disk. As the disk indexes, it comes between the head of the unit and the stamping head. Work is supported from behind while the stamping head feeds forward, stamps and withdraws.

At the next station, the marked ring drops onto the conveyor shown at left in fig. 3. The whole operation is coordinated as part of the cycle.

After stamping, rings go into the automatic heat-treating section, which is in the same bay but on the opposite side and traveling in the opposite direction to that of the turning section, so that when heat treatment is completed, the rings return to the center of the line. Because of differences in cycle times for turning and heat treating, a buffer stock has to be held in special magazines between the two sections. Three heat-treating lines are fed by four magazines. Generally, these magazines (O), (P), (Q), and (R) store work enough for two shifts—each holding as many as 3,300 ball bearings rings or 1,000 roller rings.

From the incoming conveyor, rings enter a vertical zig-zag temporary waiting section then go into the set-at-an-angle oval magazines.

Once inside the magazine (fig. 4), rings lie on their faces in compartments and circulate around the magazine in rows. Rings arrive at the oven con-

veyors in level rows of five at predetermined times so as to make full use of oven conveyor width. Release of rings from the magazine is controlled by a cam arrangement that releases five at a time. They leave the conveyor in a vertical position, but turn through 90° in the loop so that they are flat when they arrive at the oven conveyor (fig. 5).

A different distributor is used for ball bearings: the inner ring goes inside the outer before alinement. Ovens are electrically heated—those for inner taper rings (S) and ball bearing rings (T) having a reciprocating heat-resistant steel sheet that acts on the vibratory feed principle. One reciprocatory motion of the sheet is made every 6 seconds, inching the rings through the oven at desired speed.

The other oven (U), for outer taper rings, uses a conventional through-conveyor because vibratory methods might produce out-of-roundness. Furnace temperature is 1,594° F.

Rings then go by conveyor (fig. 6) which dips down in a V-shape to an oil-quench bath (V), (W), and (X) under the floor, then up again to the washing machines (Y), which use warm water and soda. After air-jet drying, the rings get the deep-freeze treatment (Z) at 6.8° F. to reduce residual austenite and insure dimensional stability. Cycle: 40 min.

Next the rings pass through the tempering furnaces (a) (fig. 7) at 302° F. completing heat treatment. Rings then go into storage magazines (b), are doled out as required and conveyed to two automatic surface grinders (c) (fig. 8) with face-ground rings ejected, passing through a demagnetizing ring because magnetic chucks are employed. Face-ground rings are fed into another battery of storage magazines (d). It is necessary to use such magazines on both the inlet and outlet sides of the surface grinding operations to balance the time differentials between heat treatment, surface grinding and other grinding, which are considerable. The surface grinders work on both inner and outer rings, but even so it is necessary to operate them only 3 to 4 hours a day.

Outside rings are surface ground during the first half of the shift, inner ones the second half. Change-over takes only 30 minutes. During the operation, a gaging unit checks size and makes automatic compensation for wheel wear. After rings are surface-ground on one side, they are turned over in a conveyor link for grinding on the other side.

Four storage magazines (d) feed four automatic grinding lines: (1) One for grinding outer taper rings. (2) one for inner taper rings, (3) one for inner ball rings, and (4) one for outer ball rings. All OD's, except for the inner taper rings, are ground on pairs of automatic centerless grinders (e), (f), and (g) (fig. 9). These do the job in two passes, where seven passes were formerly required. Improved output is achieved by employing large wheels of 29-inch diameter.

The taper track on the OD of inner taper rings is produced on two other centerless grinders (h) by the plunge-grinding method (axis of the wheel is set over at predetermined angle, while control wheel is beveled—contacting surface is at an angle to its axis, which in turn is at an angle to both the axis of the workpiece and the grinding wheel).

Conveyor feed into the grinders is controlled by a roller running on top of a ring as it enters the grinder line. When the ring moves forward, an arm carrying the roller moves down to bring the next ring into waiting position. Except for the inner races for taper bearings (where output from OD grinding is balanced with subsequent operations), further buffer magazines (j), (k), and (l) are provided because the entire day's quota is produced in one external grinding shift, as against two shifts for internal grinding operations that follow it.

A battery of eight internal centerless grinders (m) are used on inner taper rings. Whereas a shoe is employed in grinding the taper OD, in this case the work is located by two control wheels and a driving wheel. Similar machines (n) rough and finish grind the inner taper races of outer rings. This is done by setting the work over at the required angle. Throughout these operations, the ring has a cylindrical member attached to its small diameter. This supports, but does not hold, the ring, and it forms an integral part of the ring through grinding and superfinishing—to insure against distortion. Subsequent operations carried out on the inner taper ring include finish grinding of the taper OD on two centerless grinders (o), and grinding the inside face of the rib (flange) to provide the correct plane to take the rollers' axial thrust (p).

Eleven special machines grind the races of ball bearing outer rings, grinding and superfinishing internal surfaces, including the ball groove itself. The work is driven by centerless principles: the wheel is radiused and enters the bore to

contact the formed ball groove; wheel head swings with a reciprocating motion around an axis which produces the desired radius. Internal grinding of the bore of inner ball bearing races in done on a bank of four centerless grinders (r), and another group of four grinders (s) grind the ball grooves on their OD, using form wheels (fig. 10). The two special machines for plunge-grinding the taper track of inner roller rings are shown in figure 11. Figure 12 shows the external form grinders, and figure 13 shows a special centerless internal ball-groove grinder.

After grinding, the finished rings go to magazines (t), then are washed before assembly, which is done in a temperature-humidity controlled room.

Automatic inspection and gaging machines (u), such as the one shown in figure 14, have a number of inspection heads in line, and the components pass through them on an in-line transfer principle. Gaging is pneumatic-electric. Bearings outside tolerance are indicated by warning signal lamps, and rejected rings are automatically separated out. Good components go to the assembly machines, while rejects are either corrected or scrapped.

The automatic assembly machine (v) for taper roller bearings (fig. 15) has four stations: (1) Cages are taken from the magazine and placed automatically on a table fixture; rotary indexer then takes work to (2) where rollers drop into position in the separator and the inner ring is assembled, (3) a gaging head (see fig. 15) automatically inspects for correct number of rolls and rings and positioning, (4) cage is loaded and finished assembly is transferred to completed-bearing inspection units, after the outer ring is assembled.

The ball bearing assembly unit is an integration of four machines—one that grades the rings (w), one that delivers the ball (x), one that assembles (y), and one that controls radial spacing (z). All four units are tied electronically and synchronized.

The unit that does the actual assembly works this way: (1) Rings are delivered and the balls placed in the rings, (2) half the cage is assembled, and the balls radially spaced within it, (3) the second half of the cage is pressed into position, and (4) the completed assembly is checked for any absence of components.

After assembly, ball and roller bearings go through inspection machines, then through a unit that demagnetizes and removes the inners from the outers and channels them onto parallel tracks into an anti-corrosion-treatment unit (fig. 17). Then the bearing assemblies are cooled to 30° F. with freon gas. This congeals greases or anticorrosion compounds before water vapor can enter.

Last step (fig. 18): Packing bearings automatically in paraffin paper—boxes are automatically made up from cardboard, bearings go into the boxes, which are sealed, labeled, and transferred to a table where they are wooden-crated for dispatch.

Part 5. Russia's Conveyorized Machine Tool Production

Moscow.—The Russians are building high speed, universal lathes on a production line in Moscow at a rate of one every 15 minutes. Twelve thousand of these machines come off the assembly line in a year's time. They are built in much the same way that an automobile is made, only to closer tolerances. Remember that the 12,000 units represent the year's work of only one factory. And there are other plants in Russia also producing lathes.

2,000 big lathes a year

Take the new factory at Razan, about 120 miles outside Moscow. Initial production will be 2,000 large lathes a year (47.24-inch swing over bed, 10 feet between centers). The director of the plant believes that he eventually can get production up to twice that number, or 4,000 a year.

Go on down to Odessa on the Black Sea, a long plane flight from Moscow. Here is a plant devoted exclusively to making 4-ton radial drills. Some 2,000 of them a year. And the plant director says that the single production line off which they come has nowhere near reached its full capacity for turning out radials.

Outproduces United States, Britain

Measure this performance, which utilizes practices heretofore unknown in machine tool building, against the output of machine tools in the United States and Great Britain. In 1956, U.S. lathemakers produced 12,194 lathes of all kinds and sizes, or just about the number turned out in the Krasnoi Proletarii plant

in Moscow. In Britain, 14,407 lathes were built in 1951, the latest year for which figures are available. During 1956, U.S. radial drill builders shipped 1,088 machines, whereas at Odessa the Soviets are already turning out 2,000 a year.

Yet the Russians claim it takes only 18 months from drawing board to actual production on such a line, including design and manufacture of needed special machines, and sometimes the buildings to house the line.

It's capable of turning out 12,000 of these small, high-speed universal production lathes a year—that's something like 4 an hour—in a single plant and somewhere between 2,000 and 4,000 of the bigger (3 meters between centers) lathes a year in a new plant at Razan and 2,000 4-ton radial drills like this one per year on a single line that has "nowhere near reached its capacity."

How is it possible to get and then maintain such a phenomenal production rate? Perhaps there are two reasons. One is the tremendous driving force from within that seems to impel all workers, from the director down to the sweeper, to press on toward attainment of greater and greater production volume. The other is the use of conveyorized assembly, such as one finds in any up-to-date auto plant.

Take the Krasnoi Proletarii plant. One of the oldest Soviet plants, it has been turning out machine tools for less than 30 years, specializing in two types of lathes; standards and specials.

At the time of my visit, the lathe production line had just been changed over to a new model, and other alterations were in progress. The Russians are so shop proud they put boardings around any major reconstruction in the shop. They also must work under a Government decree that new building (brick and mortar) is prohibited.

It then becomes very difficult to design a line with an efficient layout in this already overcrowded plant, in which 1,000 workers are on the lathe line and 3,000 on special machines.

"Insurmountable" difficulties are a challenge the Russians seem eager to meet. During World War II, Krasnoi Proletarii was transferred to the Ural Mountains—down to the last screw. The plant was moved back one March after the war. By April it had already produced 25 lathes. The same speed of production planning goes on today. Changeover to the new model was made in November 1956. Last of the old models came off the line on October 27. By November 6, the first five new machines had been assembled. That meant installing, retooling, and producing the first machines all within a 10-day period.

The new model, a redevelopment of the previous one, is classified by the Russians as a universal screw-cutting lathe. It has higher speeds, more power than the old model plus stepless speed variation. It accommodates work up to 18-inch diameter, has speeds to 3,000 revolutions per minute, through a mechanical friction-drive variator. Feeds range from 0.177 to 0.0008 inch per revolution. Drive is from a 14-kilowatt motor. The lathe will produce all threads used in the U.S.S.R.—including English, continental, metric, and module. The lathe itself as well as the production line was designed at the Krasnoi Proletarii plant, as were many of the special machines.

200 man-hours per lathe

At Krasnoi Proletarii it takes about 200 man-hours to build a lathe—or one complete lathe a month from every man working on the line. The Russians claim that because of their "true production line technique" they can build the equivalent of a $7,000 American lathe for about $3,000. Whether or not that price includes payment for the services of Government-owned machine tool research that went into the lines and products could not be determined.

Here is a quick walk around the Krasnoi Proletarii lathe line:

Apron castings are drilled on a multispindle drilling machine designed and built at the plant. Unit heads carry out all the drilling, boring, and tapping operations required on the casting, from two sides. Castings are fed to the operator on an ordinary roller conveyor, machined, and moved on another roller conveyor. Operating cycle is automatic except for loading and unloading, and a hydraulic lift is provided by the machine. When operator loads a casting onto the lift, a lever brings it up to machine height. Cycle time on this machine: 2 minutes.

Another multidrilling machine carries out all drilling and ancillary operations on other castings, employing a centrally mounted drum indexing fixture, which brings components into position for duplex drilling operations from multiple heads.

Special milling setup

Face milling of apron castings is done on a seven-spindle special milling machine setup. Castings are pneumatic-clamped in line, with each casting clamped independently by lever. Two large diameter side and face cutters mounted on a spindle in the left head, and supported from an overarm on the right-hand head, carry out a straddle milling operation. The other two cutters are mounted on the main spindles and face mill the ends. Inserted tooth cutters are used. Two main spindles do vertical milling, while two others set at an angle, do angular undercutting and slotting. Output is 40 castings per shift.

Two other special milling machines do the overall machining of the base. Roughing is done on one machine, and casting is finish-milled on another. In roughing, two cutters on an auxiliary horizontal head, machine one side of the casting, while two angular and two vertical heads mill the faces of the slideways. The other two faces are milled by a cluster of cutters mounted on a horizontal arbor on the other side of the machine. Another cutter on another horizontal head mills surfaces on the second side of the casting.

An opposed-head duplex machine bores the headstock castings. Two components are mounted side by side and roughed and finished by the same machine by indexing the fixture. A number of vertical indexing machines, built at the plant, are used for such operations as multidrilling of covers, machining levers, and pulleys.

The assembly and painting sections have four separate conveyors: one for headstock assembly, two for subassemblies, and one to carry the lathes through spray painting. Headstock conveyor is the platen type, driven by a chain. Headstocks, placed on platens, move along the conveyor rail. At the end of the line, each assembled headstock is lifted off its platen by an overhead hoist and transferred to a bench on the other side of the gangway, where it is run up and tested through the gears. Between-machine and between-operation handling is poor by comparison with the rest of the line—such as a slinging operation to move the headstocks from the assembly line to the testing section.

Empty platens return to the beginning of the line, traveling upside down along a floor-level track just under the assembly track. The headstocks take about 15 minutes to pass each station along the line, with the conveyor moving continuously. Actual output is 40 assembled headstocks per shift. After testing, headstocks go by roller conveyor to the final assembly line. The other subassembly conveyors, which are similar in operations, also converge onto the same line, which is so long that it literally disappears into the distance, and it is full of lathes. I counted 25 positions along the conveyor, and I think there are more than that. One complete lathe comes off the line every 15 minutes.

Main conveyor indexes

The main assembly conveyor operates on the indexing principle. When it is idle, the machines rest on the floor, straddling the conveyor so that it is only loaded when transferring. Every 15 minutes, the conveyor carries all the machines forward one station. A jacking system lifts the conveyor, raising the machines slightly off the floor and moving them forward. Conveyor then stops, is lowered into its static position, waits 15 minutes, then goes on. Conveyor thus moves only the distance between stations, always returning to its original position.

The test section, primarily because of plant layout difficulties, is not conveyorized, so machines have to be lifted into the test section by sling and out again onto the conveyor that leads into the spray paint area. Aside from headstock and final inspection, little testing goes on at Krasnoi Proletarii, or in any other Russian tool plant, for that matter.

Because of plant layout troubles, the lathe does not go straight through from dressing to painting. Instead, the paint section is on the floor above, and a conveyor takes the dressed machines to a lift. Then a closed-loop conveyor takes them through three painting booths, and then to the shipping department.

It is interesting to note that the Krasnoi Proletarii line has been copied and is now in production in Communist China.

The lathe plant at Razan, about 150 miles from Moscow, is brandnew, and is just now getting into production. It has three main shops, including a new setup for producing a new model of lathe. In all, Razan employs 5,000 workers—1,200 of them on the new line. Like Krasnoi Proletarii, Razan turns out quite a few special machines, but its principal product is a new 4½-ton lathe with a swing of 47.24 inches. This lathe can be produced on one line with a choice of

60, 80, or 120 inches between centers. It has a standard range of 24 speeds up to 1,250 revolutions per minute, but this can be increased to 2,000 revolutions per minute with change gears. By comparison with the smaller Krasnoi Proletarii model, Razan's lathe is underpowered, using the same 14-kilowatt motor. The Razan lathe can be fitted with a hydraulic copying device that is mounted in the rear of the machine and can be set for copy turning or facing.

A unique feature of the lathe is use of plastic sliding surfaces throughout. This has been done for some time on reconditioned machines in Russia, but this is the first time plastic slides have become standard on a new model. The Russians claim plastics can be used with complete reliability and with no loss of accuracy, and that on the contrary, plastics achieve high precision more readily, with a minimum of friction. Plastics gave the Razan people some trouble at first because of instability, but a system of preworking the plastic now makes it stable. Tests show that the plastic sliding surfaces wear only 0.0001 inch per 1,000 working hours, and that under normal conditions it need be replaced only once in 4.5 years.

At the moment, Razan plans to turn out about 2,000 of these lathes a year, but that schedule may be doubled when the plant gets into full swing. The shop for producing these lathes has three lines, two of them side by side for machining, and the other for assembly—it's conveyorized. All three lines run the length of the shop. At the head of the assembly line, headstocks are assembled. The next section of the line assembles the saddle, and the balance is given over to main assembly and test.

Razan's production thinking revolves around this credo, "All manual work on the assembly line should be avoided, and this is even more important than handling between stations." The basic idea is to adopt automotive production techniques to machine tool output, but to maintain tolerances not achieved in auto production. Razan's lathes are basically the same as those of Krasnoi Proletarii, but because Razan is newer, its lathe has improvements in details such as plastic ways. Soon, when all bugs are ironed out, testing, painting, and final test will all be included on the main assembly conveyor. Two test methods will be used: under actual load, and a hydraulic test rig. The line is so designed that the test failure of a machine will not hold up the entire line. Because the entire line at Razan is laid out from scratch and not a revamped one like that at Krasnoi Proletarii, layout is more efficient.

"Dry-running" the line

Even before Razan had a roof over its head, machines were set up in a spare bay in one of the other shops so that trainees could learn to operate them. In this way, a complete dummy line was set up and before the new building was completed, almost every machine in it was "dry run" on test components. Thus it became perfectly practicable to close the dummy line down on a weekend, transfer the machines to the new conveyorized line, and reach full output the next week.

Some Razan specials

Some of the special machines at Razan: three 11-spindle special milling machines (built at the Gorki plant) for machining the three different base lengths of the lathes (total floor-to-floor time for overall machining of the 3-meter base will be 3 hours, 50 minutes); two multihead machines that carry out all drilling, boring, and milling operations on the saddle, one to each side of the casting, in 12 minutes; a 7-spindle unit that does all milling operations on the apron casting, including grooving, in 5 to 6 minutes; a duplex double-head machine that mills two castings at once in 6 minutes; another duplex that mills all the holes in the gearbox in 12 minutes; a machine for turning tailstock bodies that has opposing heads, carries five spindles, and rotary-indexes parts through roughing, semifinishing, finishing and grooving, and chamfering; special machines for grinding the inner taper of spindles; and vertical 6-station rotary transfer machines for use on gears, flanges, etc.

The Odessa radial drilling machine plant was bombed out, then moved to the Urals in World War II, has since been rebuilt from the ground up on the original site. Today, it employs 2,000 workers, including 288 engineers. Its production techniques are similar to those of Krasnoi Proletarii and Razan. It manufactures 15 types of radial drills in capacities up to 35, 50, 75, 100, and 140 millimeters, turning out 2,000 of them in all per year. Annual output has increased from five radials in 1946 to the present 2,000. The plant has 11 conveyorized lines, including subassemblies, the main assembly line, and the paint shop.

The heads for the heavier models (with gearboxes) are assembled on fixtures that run on rails, but heads for other models are assembled on a closed-loop mechanized conveyor, which has six working stations on either side, and has horizontal fixtures that project at right angles. The fixtures are supported on heavy mountings with a trunnion on top that allows the fixtures to negotiate the radius at each end of the line. Fixtures run between rails on the base of the conveyor unit.

Assembly is progressive around the conveyor, so that the finished assembly returns to the loading point for unloading.

The main assembly conveyor operates on the same step-by-step principle as that described at Krasnoi Proletarii, indexing one station per hour. Sequence of assembly: (1) machine base, (2) column is added, (3) radial arm is assembled, (4) head is assembled, (5) electrical components are added, (6) and (7) final assembly on head and other details, and (8) finishing.

Then assembled machines are transferred to another conveyor, at right angles to the main assembly line, for painting. It takes a machine 1 hour to go through spray-painting.

Testing is cursory, to say the least. Take a machine with a capacity of 2.76 inches in diameter, with speeds from 11 to 1,400 revolutions per minute. Complete test appears to be making the machine drill through a test piece at 112 revolutions per minute spindle speed with a feed of 0.049 inches per revolution. This sort of thing seems to be standard throughout Russia's machine tool industry, where the attitude toward inspection seems to be that every man along the line is responsible for the quality of his work and that if the components are right, and assembly is right, the finished machine is bound to be right.

PART 6. ALL MAJOR RUSSIAN MACHINE TOOL PLANTS MAKE SPECIALS, TOO

Moscow.—Every major Russian machine tool plant is set up to build special machines on a sizable scale, as well as general-purpose tools. Such plants are organized into two distinct and separate divisions, each with its own staff. This concept is believed to be different from that of any other major machine tool building country.

There are some machine tool builders in the United States and in Britain who build standard machines and specials in the same factory, but only in Russia are all major machine tool plants dual-purpose.

It is this dual-building concept, the Russians say, that is behind the Soviet Union's ability to engineer, construct, and equip a complete machine tool plant in 18 months or less—and to build the special machines for it in half that time.

In previous Reports on Russia we have discussed the functions of ENIMS, Soviet Russia's overall industrial planning and developmental organization. And we have discussed how Soviet plant-building principles are put into operation. In this report we shall discuss how intricate special machines are built to meet short leadtime plant opening deadlines.

Obviously, once a plant has gotten through the drawing-board stage much of the 18 months allowed for getting it into production has already elapsed. That leaves an average of 9 months to build the special machines it needs, and you would expect to find huge plants planned and set up to do nothing but produce special machines in specific fields—say one making special lathes for Russia's automated ball bearing lines, another making special grinders, and a third manufacturing multispindle planomillers such as those used in some of Russia's big machine tool plants.

Planning "almost casual"

Nothing could be further from the truth. Overall planning for production machines in Russia seems almost casual—the crux of such planning lies in the ability of every major machine tool plant in the U.S.S.R. to make specials in addition to its standard machine products. The specials are usually allied to the plant's standard lines; i.e., special grinding machines are produced in standard grinding machine plants.

Generally, Russia's metalworking industry is organized this way: each plant has a standard machine or range of machines that it can make on a production basis, plus facilities to build specials, semispecials, and machines needed in relatively small quantities. There are even a few plants that have no real standard product, but which turn out a wide variety of machines to user specification. Such machines are nearly always standard types retailored to fit a particular job.

This system of distributing the manufacture of special machine tools throughout the entire industry seems to work very well, but it is possible only because rigid overall control of the plan is maintained and because rigidly enforced standardization allows a project to be carried out without hindrance from manufacturers' variations.

That doesn't mean that makers of machine tools are limited to building blindly on someone else's designs, or that users are restricted to a narrow choice of specials. On the contrary, many machines are designed and built right in the same plant, and users have a wide choice of available machines, plus the right to initiate special designs and techniques if the line seems to warrant it and known methods are inadequate.

Overall control of machine tool standardization rests with ENIMS, Russia's machinery research and development organization. This has resulted in a conception of standardization that insures that table or transfer heights, for example, will follow rigid standard specifications. That makes it easier to design a standard range of bases, columns, rotary indexing mechanisms, and so on. Heads are also standardized, not only those for multidrilling, but heads for much larger units such as those on planomillers.

The basic idea is not to limit the variety of useful machines or combinations of machines, but to cut out unnecessary machines and duplication of prototype work. Because commercial competition is nonexistent in Russia, no plant keeps design or development secrets from another. Russia's industrial attitude seems to be that free exchange of information is essential in cases where several groups are thinking along the same lines. The use of highly standardized components and well-tried methods makes for effective application of the tested work of other prototype designers.

Apart from the overall control vested in ENIMS, where there is considerable freedom of design, a plant setting up a new line frequently designs and builds many of its own special machines. Even those plants specializing in very high quantity production of machine tools are expected to provide their quota of specials and small-run tools.

At Krasnoi Proletarii in Moscow, where 12,000 production lathes are turned out a year, facilities for making specials occupy a good-sized part of the plant and employ three-fourths or more of the total work force of 4,000. Krasnoi Proletarii not only built many machines for its conveyorized lathe line, it designed and built special duplex lathes for turning taper races in the automated Moscow bearing plant. The same shop, incidentally, is turning out a crankshaft grinder on a production basis, a special machine for turning the airfoil section of gas-turbine blade, vertical rotary transfer machines with both eight and six stations, plus a variety of machine tools for internal combustion engine plants, such as crankshaft grinders, lathes, and a machine for profiling webs.

Lead screw correction

Krasnoi Proletarii has also developed its own method of correction for production of precision lead screws. It's said to achieve an accuracy of 0.000060 inch per pitch, with error over 11.81 inches not exceeding 0.000087 inch. Cumulative error over a length of 8.2 feet is about 0.000874 inch. The method is used primarily on a lathe that performs finishing operations on lead screws, but it can also be used in inspection and for lead screw correcting.

Another of Krasnoi Proletarii's own designs is a camshaft-turning machine that maintains a true cutting angle throughout the lobe by continuous adjustment in relation to rise of the cam. The lead-screw correction method and the true-cutting technique are the only two developments about which the Russians are reticent to give details.

I was invited, almost ordered, to look at Krasnoi Proletarii's laboratory and development section, which in any nation where the free enterprise system exists would be kept under lock and key in most cases as far as the press or visitors are concerned.

Of particular interest was a program-controlled lathe for turning out stepped shafts which can carry out any program to a total sequence of 10. It can cope with differences in diameter of steps up to 0.39 inch achieving tolerances within 0.0006 inch on length and 0.002 inch on diameter. Where more than one pass is required, the increase of cut is set in automatically as part of the program at the beginning of each cycle.

Also shown to me was a hydrocopying device intended as an accessory to operations where copying is required only occasionally. The machine has a cam plate mounted on the front, and particular attention has been paid to easy mount-

ing and removal of the attachment—only 8 minutes is needed to remove the standard tool post and put the attachment in its place.

Russia's machine tool plant at Odessa turns out some 2,000 radial drilling machines a year, more than total U.S. annual output, and in addition produces vertical honing machines in 3 standard sizes from 7.09 to 19.68 inches for the automotive and allied industries. Odessa also produces seven types of horizontal and vertical borers, some with inclined heads for boring V-cylinder blocks.

Like Russia's other machine tool plants, Odessa turns out specials, too—special heads for radials, radials designed for automatic lines, superfinishing machines, and automatic storage hoppers such as those employed on the Moscow automatic bearing lines.

Standard units are used wherever possible in the machine tools produced at Odessa—but it's not always possible. For example, the Odessa people have had a good deal of trouble in manufacturing equipment for cylinder block lines—table heights must vary with the blocks being made. But aside from that and a few other diversions from the norm, standardization has been carried as far as possible to simplify machine tool building and to make it more economical.

One notable unit in Odessa's large experimental shop was an outsize honing machine, so big it had to be assembled in a pit. The 28-foot-high machine has a honing capacity of 19 inches diameter, a stroke of 9.2 feet, and a spindle speed of 420 revolutions per minute. Also under construction in the same shop is a smaller model (47.25 maximum stroke, 400 revolutions per minute spindle speed, 5-minute operating cycle).

Heavy radials at Odessa

Also under construction at Odessa are several heavy transportable radial drills. One such has pushbutton traverse along the bed, offers preselection of speeds, using a hydraulic change, allowing 20 to 900 revolutions per minute in 12 steps. It is designed for holes from 0.629 to 1.97 inches, weighs 7.1 tons, can work in any plane and at any angle, has an arm that swings through 360° on the vertical column, and a head with 90° vertical adjustment and 360° rotation. Main horizontal arm can be swung either 10° above horizontal or 30° below, using a hand wheel. Machine has nine spindle speeds from 0 through 850 revolutions per minute. Feed box, on the head, has four feeds ranging from 0.0039 to 0.016 inch per revolution. A reversing spindle permits right or left hand rotation, and there are facilities for depth control, permitting accuracy to ±0.0039 inch.

It was interesting to see at one end of the Odessa experimental shop a large planer made in Siberia. It seems that machine tools of various kinds have been made in Siberia for several years—and Siberia occupies an important place in Russia's plans for its future industries. Siberian plants are manned by volunteer workers who have the same status in the country as commandos or shock troops in wartime.

Next to the Odessa plant's experimental shop is its instrument shop, which seems to be more preoccupied with making keys and small components than with instruments as such. A third shop is given over to hydraulics. It is a long bay filled with a number of special machines in various stages of assembly or ready for test, including:

A hydraulic, semiautomatic precision borer for tractor wheels. This duplex machine bores from opposite ends in a sequenced time cycle. Work is loaded into a fixture and hydraulically clamped, then a pushbutton starts the cycle and the workholder moves back into position between the two heads. Heads feed in and bore the diameter, then the shoulder is machined. This isn't ordinary turning—it is an operation carried out by fine boring tools that have a radial movement imparted to them through the spindle.

Transfer machines for automotive production include an eight-spindle cylinder borer that uses transfer rails incorporated as an integral part of the table. Working cycle is 10 minutes per block using a maximum spindle speed of 700 revolutions per minute and a feed of 0.00234 inch per revolution. To avoid scoring the bored surface on withdrawal of the boring heads, the spindles stop as the head finishes the boring operation. An electrical mechanism then orients all the spindles so that the cutters are all facing in the same direction, and a small movement of the heads (0.197 inch) from left to right is imparted, relieving the cutters from the machined surface before the spindles withdraw.

The Sverdlov plant in Leningrad specializes in Keller-type copying machines and a large jig borer so like a Hydroptic that even the plant's director calls it the Leningrad SIP. This middle-sized (2,500 employees) plant is old fashioned,

badly lit, and full of obsolete machines. Yet it still turns out good machine tools.

About 20 to 25 percent of Sverdlov's output is given over to specials, including some very heavy boring machines, outsize copying machines, and machines for work on hydroelectric turbine buckets. While the need for new machine tools in this plant is urgent, practically all replacements of its obsolete United States, British, and European machines are being built in Russia. It is certain the Russians would buy replacements from the West, but the embargo forbids it, so the Russians must fall back on their own resources.

Of interest at Sverdlov is the heat-treatment shop, which is quite well equipped with vertical pits for nitriding spindles up to 13.12 feet, with a variety of smaller baths, and with three ovens.

The Leningrad SIP

Incidentally, the plant director claims that the Leningrad SIP happened simultaneously with the actual SIP optical coordinate jig borer. He admits he saw it at the Hanover Fair, but claims Sverdlov had already completed design of its similar model. Questioned as to whether they copy well-known designs from other countries, the Russians admit that their machines have the same appearance as Western machines, but as in the case of jig borers and copy millers, they claim that these are almost classical designs and that it is inevitable that new models borrow something from them.

Among the specials at Sverdlov:

A heavy copy miller with working dimensions up to 9,186 feet, and a "length from Moscow to London." Each motion has its own drive, and operation is centralized in a single level. Pushbuttons are used only to set the motors in operation.

A special borer (first built in 1951) for turbine reduction gear casings that has a boring capacity from 16.5 to 13.2 feet diameter, with a bar 13.78 inch diameter and 26.25 feet long. Machine features automatic positioning on the axial plane, with the boring cutter fed out radially by means of a screw arrangement within the spindle. Feed is preset with a dial graduated in 0.00039 inch. Thermorelay and clutches provide protection against overload. Spindle drive is from a 30-kilowatt motor.

PART 7. AN INSIDE LOOK AT TWO RUSSIAN GRINDING MACHINE PLANTS

Moscow.—Grinding machine plants, like all other major Russian machine tool factories, play a dual production role—turning out special grinding machines as well as standard ones. Two notable examples of this are the Ilyich grinding machine factory in Leningrad, which is planning to automate soon, and the Moscow grinding machine plant, which today turns out some 70 different types of machines and will take on manufacture of specials ranging from gear grinders to special machines for automatic grinding of plowshares.

The first of these, the Ilyich plant at Leningrad, is noted in Russia for its production of special machines, including the grinders for the Moscow automatic bearing plant (AM—Jan 14, 1957, p. 147).

Ready for automation

Dating back to the 1930's insofar as output of grinding machines goes, Ilyich has its standard production lines laid out in such a way that they can easily be conveyorized and automated. In fact, Ilyich today is high on the list of Russian machine tool plants slated for automation.

Following World War II, all of Ilyich's old machine tools were replaced and production was modernized so that the plant's prewar grinding machines, too, could be completely revamped. By 1948, Ilyich was building a number of special automatic grinding machines in addition to its regular output of cylindrical, ball-race, gear hob, saw, tool and cutter, and flexible grinders. High-frequency spindles made their first appearances in 1949 on an internal grinder for small bearing races, so did the first optical profile grinder.

Two new universal grinders were introduced into the standard product line in 1951, one for full taper grinding, and the other a machine that could produce tapers only to within limited ranges. Also made in 1951 was an automotive grinder for external grinding of radiused form on ceramic rings, which included automatic diamond dressing.

By 1955 Llyich's universal grinder had evolved to the present model, which incorporates a special method spindle balancing and variable speed drives.

Among recently designed specials at Ilyich are crankshaft grinders, superpolishers, a special grinder for producing helical grooves—and a special grinder that grinds deep slits (one-quarter to one-half inch and only 0.0079 inch wide) radiated at equal space around a small part.

Most of Ilyich's machines have been installed as recently as 1955, and 97 percent of them are Soviet made. But because either of a poor general finish or a casual approach toward cleaning the surfaces, most of the machines look much older.

The Ilyich machine shop is fairly conventional, equipped with a number of milling machines and center lathes. Most of the lathes come from the 12,000-lathes-a-year Krasnoi Proletarii plant, and the milling machines from the Gorki factory. Turret lathes used at Ilyich were built by the Ordzonikidze plant in Moscow and by a plant in the Siberian Urals. The Moscow grinding machine plant has made such machines for use at Ilyich as the thread grinder shown in figure 1 grinding an oilpump worm for use on Ilyich's cylindrical grinder assembly operations, and the large slideway grinder shown in figure 2 working casting for a cylindrical grinder.

Ilyich's assembly section for cylindrical grinders is in a well-lit bay with plenty of room. Lines are laid out for the various models, and each terminates at the plant's well-appointed paint shop. Ilyich turns out more than 300 cylindrical grinders a year such as those shown in figure 3 in the same bay as a number of similar but larger machines. Also going through these lines is a production order for crankpin grinders.

Incidental intelligence: top spindle speed of an Ilyich production model is 30,000 revolutions per minute, although higher speeds have been developed for specials. One project Ilyich has in mind is the lightening of spindles as soon as alloys can be found that will maintain stability: another is development of hollow spindles for grinding.

Moscow grinder plant

The Moscow grinding machine factory is called the department store of the grinding industry, earnings that title by the wide variety of grinding machines it can virtually produce from stock. Moscow concentrates on types not made by Ilyich, turning out some 70 kinds of grinding machines, including surface grinders, slideway grinders, slotters, machines for grinding pistons, specials for grinding plowshares, superfinishers, gear and spline grinders.

Moscow is set on its own grounds, is a large plant employing 2,500. With most machines made on a jobbing basis, production lines naturally are not clearly defined, with the possible exception of the surface grinder assembly shop. It has been a grinder plant for the last 15 to 20 years, is divided into three divisions, turning out surface grinders, specials, and gear grinders. Within these divisions, many different types and sizes of machines are produced. Spline grinders, for example, are built with capacities of 0 to 9.842 feet in three sizes—0 to 3.281 feet, 3.281 to 6.562 feet, and 6.562 to 9.842 feet. Surface grinders are made either in horizontal types with rectangular tables or with vertical spindles and rotary tables. On the former, the range extends from tables 11.81 by 29.52 inches to 19.68 by 98.5 inches. Vertical spindle machines are available with tables from 15.75 to 59.05 inches.

Slideway grinders are made with table lengths up to 26.25 feet, with 52.5-foot-long beds. Range of gear grinding machines extends from 11.8 to 47.2 inches diameter, up to 16 module.

Employ Western machines

To make these machines, Moscow employs quite a few made-in-the-West machine tools, mainly from Germany, plus a fair proportion of Russian-built ones. In the plant's measuring and standards laboratory, all instruments, including several interesting optical ones, are of Soviet manufacture.

Grinders made in same bay

Both surface grinders (figure 4) and spline grinders are manufactured in the same bay, as are the large face grinders shown in figure 5. Internal grinders are made in variety of types and feeds, many of them automatic. One centerless internal model is adaptable to either cylindrical or taper grinding, is magazine loaded and fully automatic. Its cycle includes rough grinding, automatic wheel dressing, finish grinding, and ejection of the finished component. Cycle time is adjusted to the diameter of the work, spindle speeds range from 9,000 to 15,000 revolutions per minute.

Grinds own ways

Without exception, all ways are ground on machines made by the Moscow plant, such as the slideway grinder shown in figure 6 reproducing itself. It is a 26.25-foot machine, with a 52.5-foot bed in three sections.

In the gear grinding section at Moscow, all grinders under assembly were based on the generating principle, with the largest of them having a capacity up to 49.21 inches, 16 module. Generally, production of gear grinders is conventional, except that a high frequency installation does the work normally done by flame hardening.

"Semispecial" output

In a plant such as Moscow, it is difficult to assess where the dividing line lies between "one or two at a time production of standard machines, and specials. A great many machines building at Moscow could probably best be classed as semispecials.

One item of interest at Moscow was a multispindle slideway grinder being built for the Krasnoi Proletarii lathe plant, where it is probably destined to carry out the grinding of slideways in a single operation on the production line.

Another special, built at Moscow for face grinding piston rings, has constant grinding wheel speed, and variable table speed. Table has a diameter of 31.5 inches, with stepless speed variation. The table is so flat that it is tested within three twenty-five-thousandths of an inch over the whole surface. Also of note at Moscow: a two-spindle automatic surface grinder for automotive production that uses a magnetic table and has automatic magazine feed. The demagnetizer is fitted to the output chute.

Face grinder makes handtools

One unusual application of a face grinder at Moscow is for production of wrenches, spanners, and similar handtools. The components nest in appropriately shaped holes in horizontal rotating disks that carry them through the grinding process. Also seen at Moscow: precision machines for piston grinding that are claimed to operate consistently to an accuracy within five twenty-five-thousandths of an inch.

One special developed to grind large plowshares looks clumsy, but it performs an awkward job on a peculiarly shaped workpiece—grinding the surface, and sharpening the back, front, and edge of the blade. The machine employs seven spindles, four of them working on the blade in the first four operations, with the rest of the spindles coming into play in sharpening the front, back, and edge in the last three operations. Apart from loading and unloading, the whole cycle is automatic. Floor-to-floor time is 7 seconds.

Other special types noted: a surface grinder with inclinable table; and a special three-spindle slideway grinder for leading ways, which also carries a normal grinding wheel that can be employed when the slideway spindles aren't in use. This machine has proved particularly useful in doing maintenance grinding in shops where it needn't be employed full time on slideway grinding.

Also at Moscow is a high-production setup for grinding 8,000 piston rings an hour. This is done on a two-sided vertical spindle machine that has a high-precision table. Components are moved through the grinding area by the differential forces produced by setting one spindle slightly off center from the other. This machine works as one of a pair—the second is a vertical spindle superfinishing machine. Machines of the latter type normally use iron wheels at Moscow, and it is claimed they provide a surface finish of less than one twenty-five-thousandths of an inch. An abrasive disk can also be used with this machine by incorporating a truing device.

PART 8. MASS-PRODUCING ENGINEERS FOR SOVIET METALWORKING

Moscow (special to American Machinist).—Soviet technical training has come in for much newspaper and magazine mention in recent months—ever since it was discovered that Russia has put such training on a mass production basis in an effort to outstrip the West.

Just what are the underlying motives behind Russia's drive to create armies of engineers and scientists? How is it being done?

To answer these questions it is first necessary to realize that Russia was underdeveloped industrially just three decades ago.

Contrast that with the Russia of today: 6.5 million of its workers have received either advanced or specialized education. In 1954, the latest year for which statistics are available, some 1.7 million people between the ages of 17 and 35 were enrolled in universities and full-time polytechnical institutes, or were taking correspondence courses in specialized subjects. And last year there were more than 1.6 million teachers on the faculties of Russian schools. This year there are even more.

Two basic Russian attitudes have made this possible. First, there is no more honored position in the Soviet Union than that of teacher. To the Russian it is inconceivable that teachers would be so poorly paid and occupy such a low position on the economic scale that they would be forced, with the exception of a dedicated few, to go into other occupations.

Second is the attitude of Russian youth toward higher education. As the head of one of Moscow's leading technological institutes put it, "They would bring in a bed and sleep here, if it weren't that their parents expect them home. We are always full. The students come here because that is what they have made up their minds to do. It is a goal they have achieved."

Technology starts early

Primary schooling is compulsory today in all of Russia, and in the industrial areas both primary and secondary schooling (ages 7 to 17) is compulsory. The secondary (high) schools today incorporate technological training. After completion of the 10 years' compulsory education, these avenues are open to students: working toward a degree from one of Russia's 33 universities, or toward a diploma from a technological college, part-time or evening study at a technological college; or qualification by examination to take a correspondence course.

Odessa, for example, a medium-sized city with a fair amount of industry, has a 2,000-student university, and 16 polytechnical institutes, each specializing in a different curriculum, ranging from pathology to refrigeration engineering. One such institute can take as many as 3,000 students.

Industrial plants not only cooperate fully with these schools, they also maintain their own trade schools. In one Odessa plant, the trade school has three grades, teaching all the crafts employed in the plant. A Moscow plant employing 4,000 has a complete 4-year course in theoretical and practical training, plus evening courses. Some 300 students attend the latter, and 400 attend during the day as part-time students. The plant has a permanent faculty of 40.

Another plant, employing 2,500, has an apprentice school, evening classes, and a technical school with a 4½-year curriculum. It is common practice for such in-plant schools to accept students from "outside." While this obviously provides the plant with a source of trained specialists, the outside student is under no obligation to work there after he finishes his courses. Generally, such courses are the equivalent of our apprentice training, but they teach theory as well as practice.

As an example of what Soviet higher education is doing for metalworking, let's look at Moscow's Machine Tool Institute, which specializes in training designers and technicians for the machine tool and small tool industries. According to its director, the "Stankin" (a nickname derived from its initials) Institute is "the leading one of its kind, not only in the Soviet Union, but in the world."

He may well be right. Stankin has 2,000 students on full time and 1,000 more attending evening classes. The full-time course takes 5 years, the evening course 6 years. During that time, the student devotes 4,500 hours to theory, the rest to practical work, plus plenty of homework. Even with its capacity for 3,000 students, Stankin is no longer able to accommodate all who want to get in.

What is the secret of Stankin's success in so popularizing a specialized field of study that it turns students away from its doors? The director explains it this way:

A spirit of competition for entry—"only the best" secondary school graduates win out in open examinations.

The high caliber of students—each student is examined periodically and those who won't make the grade are weeded out to make room for others.

Compulsory lecture attendance—by law all students are obliged to attend theory lectures unless they have a valid excuse for absence.

The right combination of theory and practice.

Preentry training—students who come to Stankin have had a broad basic education, and they have had a sense of the value of scholarship instilled in them.

Stankin is controlled by the Ministry of Higher Education, and is so conceived as to graduate its students with specialized knowledge in all the principal fields of metalworking: Machine tool design, production engineering, control operations, automation and transfer mechanisms, presswork, chipless production, gaging and gaging techniques, and so on.

While the student body is predominantly male, some of the day courses, particularly the ones dealing with gaging, have 30 percent girl students. This percentage is also borne out in the plants themselves, where the precision inspection departments are largely staffed by women, but not necessarily with those who have a higher education.

First 2½ years nonspecialized

Stankin is very much alive to the dangers of overspecialized education. Thus its curriculum has been designed to give all students as wide a general background as is possible. There is no specialization in the first 2½ years. All students are taught such general engineering subjects as mathematics, physics, chemistry, theoretical mechanics, strength of materials, metallurgy, machine theory, basic principles of machine tool design, hydraulics, and others.

Stankin has well-equipped workshops for practical work during these years, with facilities provided for metal cutting, welding, casting, forging, and various other metalworking techniques.

Specialization and outside experience both begin with the third year, when each student is assigned to a plant for 5 weeks. Those taking machine tool classes generally work as machine operators, and are paid for the inplant work they do. From here on out, the amount of outside work builds up, with many students working voluntarily in plants during the summer holiday. They replace regular workers and are paid at the same rates.

The special subjects a student can take from his third year on out allow a wide latitude: Theory of metalcutting machinery, theory and practice of cutting tools, industrial economics, planning of metalworking plants and organization, calculation and design for metalworking processes, technology of machinery, buildings and machine foundations, and safety techniques, among others.

In the fourth year, outside practical experience increases to 7 weeks, but takes a more advanced form—with accent on designing and production engineering. Students are taken into the design department of plants, where they are given a job to carry out. According to a student's specialty he may be asked to carry out a production planning or production engineering project, design cutting tools for a given job, or in the instrument field be set a task involving design, selection, and use of measuring instruments. The results of such assignments are assessed independently by Stankin, and by the chief design engineer of the plant.

Prediploma practice

Practical training in the fifth and final year increases to 9 weeks. This is known as prediploma practice, and it must result in a work that is of practical use to the industry. Not only that, the student must if necessary defend it in his final examination. But by the time he reaches this stage he will already have carried out three similar projects during his 5 years' study.

Typical projects: designing machine tool components, designing handling mechanisms, planning a technical process (if the student is specializing in production engineering), or planning a design project.

One such project completed by a student was a design for a hydraulic copying lathe—complete with working drawings of the hydraulic and electrical system, gearboxes, etc., to such a degree that the lathe could have been built without reference to any outside source.

When ready to do his diploma project, the student is sent to a plant to do the job. This means he's utterly on his own, can't rely on help from fellow students, or play upon known teaching quirks of instructors.

Projects similar to the design of the hydraulic lathe apply in other fields. If a student's specialty is production planning, his diploma project might be the complete production planning for a new high-quality production shop. Of if he is studying machine design, his task might be to design a new machine tool, taking into account foreign developments as well as Russian ones.

Stankin shop practice

What about shop practice at Stankin? By way of illustration let's look at a typical student's schedule in advanced cutting tool design. The shop itself has dynamometers fitted to all its machines to facilitate metal-cutting research. There are three lathes, milling machines, a surface grinder, and drilling machines, among others.

This shop is used only by advanced students in cutting tool design and application. Each of these students has a special schedule drawn up for him, in which he is assigned eight workshop jobs that will put his theories into practice. The shop is also used for advanced research, which may or may not be in the curriculum. Third year students and upward can use the shop for this purpose.

Pregraduation experiments

As previously mentioned, each student is required to complete eight shop experiments before graduation. In the metal-cutting curriculum, experiments cover such fields as cutting tool geometry, metal deformation during cutting, calibration of a lathe dynamometer and use of a dynomometer to measure cutting forces during milling, measurement of temperature during cutting, wear of cutting tools, influence of cutting techniques and the geometry of cutting tools on surface finish, geometry of drills, calibration of a dynamometer for a drilling machine, measurement of cutting forces in drilling and boring, and tool geometry for milling cutters, broaches, and twist drills.

Stankin Institute insists that "design and technology should cooperate"—that before a student graduates into a state design bureau, he must have had plant experience as a machine operator, that he must by his own merit have achieved the grade of foreman and subsequently shop superintendent.

Proof that close relationship between school and industry practice pays off in Russia lies in the fact that as many as one-fifth of all diploma projects have actually been taken up by plants and put into production, or if a planning scheme is involved, put into actual operation in a plant.

Exam to end all exams

The graduation examination is more than a test of technical ability. It evaluates a student's initiative, his ability to defend his own judgment without preparation, and his ability to deal with subjects "off the cuff." All graduating students are heard by a state examination commission, which in the case of machine tools is made up of three or four teachers or specialists, three or four plant men, a production engineer, a designer, and an industrial economist. The head of the examining commission more often than not is from a rival school, which naturally makes it tougher on the student. The actual examination takes place this way: the student is called into a room before the commission and without any preliminary must justify his diploma, and explain everything to do with it—all without leads or questions from the examiners. At the end of 30 minutes he must answer critical questions, not only from the board but from any member of the public who happens to wander in off the street. Thus, confronted by someone who knows absolutely nothing about the subject, he has to clarify what he has said.

If a design student has introduced something new in his diploma project, he isn't asked how he solved an equation, or how he applied mathematics to its design. Rather, he is asked, "Where did you get this from? Do you know another design like this? Why have you used this one?"

Criticizing the critics

After the questioning, the commission criticizes the student's diploma project right in front of him. If he doesn't agree with what is said, he can in turn criticize his critics and gets marks for it.

In reaching final decision, the committee takes into account another independent judgment—that of the chief designer or department head of a plant where the student's project has been sent for criticism. In the final grading, the commission alone can decide the student's classification, which can be one of five things: Grade 1—"awful," grade 2—"unsatisfactory," grade 3—"fair," grade 4—"good," and grade 5—"excellent."

Failures are few

The number of failures is neglible. Most students fall into the grade 4 ("good") classification, and anywhere from 5 to 10 percent into the "excellent" category. If a student fails the final exam, the commission can place him in a different technological class, i.e., an engineer could be downgraded to technician. There are virtually no second chances to go back and retake a course or part of a course. In Russia, if you flunk you've had it.

[From American Machinist/Metalworking Manufacturing, Oct. 16, 1961]

WEST EUROPE PACES FREE WORLD GAINS IN MACHINE TOOL OUTPUT

West European countries, including Great Britain, produced almost 40 percent of the world's output of machine tools in 1960, according to a study made by the European Committee for the Cooperation of the Machine Tool Industries.

Eastern Europe, plus Communist China, turned out better than 31 percent of the total. The United States, which in the 1955–57 period built around 40 percent of world production, was just under 25 percent. Last year was the third straight year in which these relative ratios have been maintained with only slight variations. The study converts the monetary value of each nation's shipments into Swiss francs as a common denominator.

Russia boosts output

Russia's manufacture of machine tools rose to 183,500 units last year from 160,000 in 1959 and 152,000 in 1958. Most of the increased output went into Russian plants. In sheer numbers, even Communist China has been outproducing the United States. It built an estimated 75,000 machine tools in 1960, about the same number as in 1959.

Communist bloc production

The Communist bloc (Russia, East Germany, Czechoslovakia, Poland, Hungary, and China) produced 371,000 machine tools in 1960. That compares with 34,000 in the United States (as reported by the National Machine Tool Builders' Association); the European Committee study gave no figure for 1960 U.S. output, but put shipments in 1958 and 1959 as about 65,000 units each year.

During the past 3 years (1958, 1959, and 1960) the Communist countries, including China, have built more than 1 million machine tools. That is more than the U.S. industry has turned out in all the years since the end of World War II, including the Korean war period.

West Germany paces Europe

West Germany continued in 1960 to be the principal European producer of machine tools. It built 43 percent of the total production of countries in the European Committee, as against 40 percent the previous year. The study noted increased output of machine tools in Japan (21 percent), in India, and in Brazil.

Orders rise in EC countries

In the four "pilot" countries of the European Committee (West Germany, Belgium, France, United Kingdom), bookings for 1960 and early 1961 exceed 1957–59 levels by about 90 percent.

West European nations exported in 1960 42 percent of their machine tool production (it was 47 percent in West Germany, 26 percent in Britain, 24 percent in France, 33 percent in Italy, Switzerland 71 percent). That is a gain over the 39.9 percent in 1958 and 38.1 percent in 1959. Germany, Britain, France, and Italy provided the increase.

About 45 percent of the exports by European Committee countries went to other nations in the European Committee. Eastern Europe—Russia and her satellites—took 6.5 percent, the highest in recent years. Asia loomed large, with 16 percent, and Latin America with 9.5 percent. North America (United States and Canada) accounted for 7 percent.

U.S. machine tool exports

U.S. machine tool exports, the survey reveals, were distributed about like this in 1960: 44 percent to European Committee countries, 21.5 percent to Asia (mostly Japan), 17.3 percent to Latin America, and 12.5 percent to Canada. Exports from Russia and other East European nations to destinations outside the Communist boundaries were very small.

Imports into the United States, the study says, "remain at a low level." In 1960, as in the 2 previous years, they were around 6 percent of total deliveries to domestic users, with more than 40 percent coming from European Committee nations. [Dollar value of machine tool imports is based upon the value in the country of origin. To get at the true value of import figures, it is necessary to multiply the dollar value of imports by a factor of two and a fraction.—Editor.]

Metal-forming machines gain

The study mentions the increasing importance of metal-forming machines. U.S. production of machine tools (in value) broke down in 1960 to 78 percent metal cutting and 22 percent metal forming. In France, based on weight, the ratio last year was 62 percent metal cutting and 38 percent metal forming.

West German figures on the relationship between cutting and forming types are the most detailed available anywhere. On the basis of value, they show that two-thirds of production last year were of metal cutting machines and one-third of metal forming.

German production of turret lathes and automatic and hydraulic presses is rising, while production of planers, lathes, and drilling machines appears to be falling off.

Production of milling machines, gear cutters, grinders, plate formers, and wire- and bolt-making machines has been quite stable over the last few years in Germany.

Machine tool orders

[Value in millions of Swiss francs [1]]

	1957	1958	1959	1960	1st quarter, 1961
West Germany, Belgium, France, United Kingdom	3.275	3.206	3.981	6.728	1.617
United States [2]	2.821	1.658	2.837	2.830	.744

[1] 1 Swiss franc=$0.2325.
[2] European orders are not directly comparable to U.S. orders because of differences in types of machines covered.

Where United States and European committee tools have been exported

[In percent]

Destination	European Committee		United States	
	1956	1960	1956	1960
European Committee [1]	53.0	45.5	50.0	44.1
Other European countries	9.5	6.5	1.8	.9
Eastern Europe	3.0	7.5	0	.1
Africa	4.5	3.5	.8	.9
North America [1]	8.5	7.0	25.8	12.5
Latin America	7.0	9.5	12.1	17.3
Asia	10.0	16.0	5.8	21.5
Oceania	4.5	5.0	3.7	2.7

[1] European Committee nations' exports to other European Committee nations; United States exports to Canada.

German production of machine tools (in value)

	1952	1953	1954	1955	1956	1957	1958	1959	1960
Percent metal cutting	75.0	74.0	73.0	70.0	72.0	72.0	69.0	67.0	67.0
Planers	7.2	5.7	4.3	3.7	3.6	3.8	3.4	3.3	3.2
Lathes	20.7	18.5	17.3	16.7	16.7	16.4	14.9	12.5	13.5
Turret lathes	6.0	6.6	6.8	7.8	8.4	7.5	7.4	7.9	8.0
Drilling, tapping machines	8.7	8.5	8.5	7.9	8.5	7.0	5.2	5.8	5.5
Milling, boring machines	10.3	13.1	12.5	10.4	10.4	11.5	11.4	10.0	9.1
Grinders	9.9	9.9	10.6	9.9	10.3	10.1	11.0	10.4	10.5
Gear cutters	3.8	3.5	3.4	3.8	3.6	3.4	3.4	3.7	3.6
Percent metal forming	25.0	26.0	27.0	30.0	28.0	28.0	31.0	33.0	33.0
Automatic presses	7.4	6.1	6.6	9.5	8.3	7.6	7.8	10.0	10.2
Hydraulic presses	2.0	2.7	3.1	3.6	3.0	3.6	4.0	4.3	4.7
Plate formers	4.3	5.1	5.0	5.3	4.8	5.3	5.8	5.5	5.0
Wiremakers	4.8	5.1	4.9	5.0	4.6	4.5	5.6	5.5	5.4
Boltmakers	1.5	1.4	1.4	1.3	1.6	1.6	1.7	1.6	1.6

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NOTE.—The Senate Internal Security Subcommittee attaches no significance to the mere fact of the appearance of the name of an individual or an organization in this index.

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